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Printed in the U.S.A. GST # 1234567890101.  
Smart Computing is published monthly by Sandhills Publishing Company, 131 West Grand Drive, P.O. Box 85380, Lincoln, NE 68501.  
POSTMASTER: Send address changes to Smart Computing, P.O. Box 85380, Lincoln, NE 68501.





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# July Focus: Top Systems

It can sometimes be difficult to face that fact that any new computer you buy will enter the age of obsolescence within three or four years. Sure, that old PC might still be able to run programs, but cutting-edge apps will probably be way out of its league.

So should you refrain from buying a new PC? Certainly not; nearly all electronics face obsolescence. The key is buying the perfect product to fit your budget and lifestyle. Keep in mind that cutting-edge systems will not enter the ranks of the dinosaurs as a lower-end system might.

Whoah! Don't rush off to buy your new toy just yet. You'll want to first read through our PC head-to-heads; we look at systems from \$799 all the way up to \$3,595. Sure, that \$3,595 system may be perfect for some of you, but for others, that \$799 system is more than enough.

Repeat this as a mantra: "The key is buying a computer that meets my lifestyle, needs, and budget." Now let's get shopping.

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# Before You Buy A New Computer

## What You Need To Know



be misled. Let us help you make every dollar you spend count.

■ **The 20-Years Question.** Most buyers are faced with the choice of buying from a national-level, recognized PC "name brand" (IBM, Dell, HP, and others) or a lesser-known, possibly local clone dealer. Many people look on the latter group with disdain. But remember this: Gateway started out in a garage and Dell in a dorm room. Let's not forget that anyone can print up a bunch of stickers and paste them on the front of a PC chassis. Name brand machines can be lemons and clone boxes may blow the socks off any competitor and vice versa. This is why it's important to understand what goes into the box.

Big name systems have several advantages. First off, you generally have an assurance that the company has a satisfactory history of customer support and deep enough pockets to stay in business throughout your warranty period (which tends to be longer with name brands than local clone shops). Name brand machines undergo more extensive testing because they draw more attention. Whereas a huge number of clone dealers only half-heartedly support FCC electronics requirements, name brands spend the thousands of dollars to get their configurations approved. Moreover, because name brand boxes work from a base number of semi-constant configurations that users can

only partially modify—try finding a consumer name brand that lets you choose between motherboards—these base configurations are extensively tested for compatibility. When the machine arrives, you can be nearly 100% assured that there will be no software problems until you begin creating your own.

On the other hand, local dealers can build a PC completely to your specifications, everything from the motherboard to the mouse. Naturally, dealers have favored brands of components in order to simplify their inventory needs, but buyers still have the option to custom-order anything. If you want a certain brand of memory in your PC, dealers can do that. Few consumers have the in-depth industry knowledge to know exactly which components are best and wind up relying on the dealer's expertise and honesty. A good dealer can probably build you a better PC than any name brand. A fly-by-night operation (and there are many) will take your money and run.

For both name brands and dealers, if you're in doubt, ask the vendor how long it has been in business and check with consumer groups like the Better Business Bureau (<http://www.bbb.org>) to examine any complaints. Call or visit sales and technical representatives, ask questions, and get a feel for how attentive the company is to your needs. If you're not careful going in, there will be no one to blame but yourself if things turn sour.

■ **A Note On Longevity.** Every PC sales representative dreads hearing the words, "I want a PC that will last me five years." Mechanically and electronically speaking, that's no problem. Most PC components last for a decade or more with proper maintenance. But the fact is that if you can make a low- to mid-range PC

last for two years without an upgrade, you're doing well. A high-end box that costs more than \$2,000 might get three years of use without an overhaul. This assumes that you want to keep somewhat abreast of current software trends, which consistently demand more robust hardware.

This is why we like to counsel most



**CPUs and motherboard chipsets work hand-in-hand.** Pictured here, the Intel 850 chipset was designed specifically to utilize the features of the Pentium 4 processor.

If you're a PC novice on the road to buying a first or second computer, see if this makes you feel better: It's never easy. Even for seasoned professionals, there's something about stepping up with your own money that casts the entire PC making decision into a new, indistinct light. The market races on. The ideal specifications, dependable brands, and market hype you knew from 12 or even six months ago might all be gone.

Only the uninformed jump in and say, "I've got \$1,500, and I want to buy a [insert brand here]." That approach may work on TVs and toasters, but not in PC purchasing. To make an intelligent purchase that will become an investment rather than a liability, you need a decent grasp of what goes into a PC and the kinds of questions you should be asking throughout the buying process.

We'll break down the issues for you by component and illustrate some of the ways you can

buyers against any warranty longer than three years. A one-year on-site warranty is a hallmark of reputable national vendors, and most offer a one-year parts/three-years labor guarantee. If you want to renew the on-site warranty, we suggest only doing this one year at a time. In two years, you're likely to reach the point where you'll either replace the machine or heavily upgrade it, which will likely void your warranty.

Now let's look at all the major system components in turn, examining the critical issues you need to address.

■ **The Foundation: Motherboard.** When you shop for a name brand system, you generally have no say in which brand of motherboard you get or the kinds of specifications it has. In general, top-notch system integrators like Dell and Compaq use very stable boards, and the

average user need not worry about performance issues. However, the norm is that the cheaper the system, the less expandable the motherboard will be.

Less expansion means two things. First, you'll have fewer slots for adding in PCI (Peripheral Component Interconnect) cards. Some low-end systems now come with no slots at all. So should you want to upgrade your sound card or add a SCSI (Small Computer System Interface)

## Other Issues

**W**e've outlined what you need to know about the major system components, but there are several others that get less attention. When you're interrogating your sales rep, be sure to ask about these PC ingredients. Often, it's the little things that make or break a satisfactory experience.

**Basic ports.** One way vendors now reduce system cost and size is to eliminate the legacy ports, meaning the serial, parallel, and PS/2 connections. Intel and others have argued that legacy equipment increases system instability, which can be true in some cases. Generally, though, few users experience this, and the ports are inexpensive. Not having legacy support may severely curtail your peripheral options when you consider all of the parallel printer, serial PDAs (personal digital assistants), PS/2 keyboards, and all the other legacy-compatible hardware on the market.

**High-speed ports.** Today, USB (Universal Serial Bus) is ubiquitous across all PCs, but a significantly faster USB 2.0 spec is expected by next year. During the cross-over period, you don't want to get stuck with the older format. (Salespeople will tell you it's no problem to stick in an after-market USB 2.0 adapter card, but this is risky and unnecessary. Make sure the feature is on your motherboard once

available.) If you plan on using multimedia peripherals, especially video cameras, make sure your system also has built-in IEEE 1394 (FireWire) ports. Many low-end systems omit this.

**Keyboard.** When you spend hours a day at your PC, make very sure you have a comfortable keyboard. Some models, particularly cheap ones, have a "clacky" feel which is very different from a good quality "click" action. Some users dislike the noise in a click keyboard and prefer a "soft touch." One advantage of a local dealer is that you can try different keyboards out before you commit. And be wary of split design "ergonomic" keyboards. Professional opinions vary on whether or not such designs actually reduce carpal tunnel syndrome. Some users love the split layout; others find it impairs their typing speed.

**Mouse.** Microsoft (<http://www.microsoft.com>) and Logitech (<http://www.logitech.com>) are the two main mouse brands, and both are of excellent quality. Cheaper no-name brands often break quickly and have poorer accuracy. (For the best mouse accuracy, select one of the higher-priced optical mice.) Check out either Kensington's (<http://www.kensington.com>) or Logitech's line of curvaceous trackballs if you don't want to chase your mouse across the desk, but make sure the curves fit your hand. Be

extra careful if you're left-handed since both mice and trackballs are almost always designed for right-handers.

**Modem.** Nearly all systems now come with built-in 56Kbps (kilobits per second) modems. As with integrated video, these integrated modems are stable, but their speed may slack if the system is busy with other tasks. Similarly, the modem may drag down other applications. You may still find some PCI-based Winmodems that rely on software for modem processing. These are the least stable and poorest performing of all modems. The best course is to get a PCI modem like those from US Robotics (<http://www.usr.com>) or Diamond/Supra (<http://www.supra.com>) that have dedicated onboard processing chips. If possible, try to get a modem that adheres to the new V.92 protocol.

**Networking.** Home networking is becoming prevalent and many systems now come equipped with Ethernet ports. This isn't necessary if you plan on networking by wireless or phone line methods, but Ethernet is another function commonly supported at the chipset level. You want a solution that handles 100BaseT signals, not just 10BaseT. If you plan on using HomePNA phone line networking, make sure your vendor has tested its solution in many other configurations and is recommending a card that is

HomePNA 2.0 (10Mbps [megabits per second]) compliant.

**Other storage.** CD-RW (CD-rewriteable) and recordable DVD are not the only external storage options. Amazingly, 1.44MB floppy diskette drives still ship with most PCs, and we shouldn't recommend that you be among the first brave souls to abandon this living relic. Tape drives remain perhaps the easiest full system backup method, although they're painfully slow. Iomega's Zip and Jaz drives (<http://www.iomega.com>) are still acceptable if you plan on working with other people who still use that media, but otherwise the formats are increasingly impractical. Likewise, the LS-120 format is all but dead.

**Power protection.** Do you get a lot of "brown-outs" when major appliances turn on? If you live in an area or home with fluctuating power conditions, you need more than just a surge strip. (Most of the cheap models don't work anyway.) When voltage fluctuates, it gradually roasts the circuits inside your PC, so get a voltage regulator. Many low-end UPSes (uninterruptible power supplies) from vendors like Tripp Lite (<http://www.tripplite.com>) and Belkin (<http://www.belkin.com>) now come with automatic voltage regulation. You may need to order a UPS from somewhere besides your PC vendor, as many computer houses remain strangely ignorant of power concerns. □

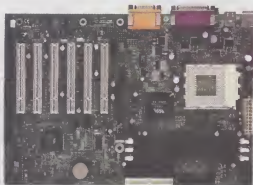
adapter, you'll be left in the cold. Second, cheap boards use cheap BIOS (Basic Input/Output System) chips. The BIOS regulates what kind of hard drive you can use, how fast your memory or CPU can run, and other important performance elements. Probably the first thing to look at in the PC buying process is the BIOS and exactly how much it will let you upgrade from your initial configuration.

Ideally, your motherboard should be non-proprietary, meaning that if the board fails or you want to upgrade it, you can order another board from leading manufacturers like Tyan (<http://www.tyan.com>), Intel (<http://www.intel.com>), or Asus (<http://www.asus.com>) and swap out your old model. This is almost always the case with clone systems. With name brand machines, the chances of having a generic motherboard are greatly reduced.

■ **The Brain: CPU.** You have two main choices: Intel (<http://www.intel.com>) or AMD (Advanced Micro Devices; <http://www.amd.com>). Industry insiders will tell you that Intel is a more compatible chip with the many thousands of software titles on the market, although specific examples of this are scarce. Currently, most benchmark tests show that the less expensive AMD Athlon is faster than Intel's Pentium III and Pentium 4 at equivalent speed ratings. However, such benchmarks need only concern users who work with high-end gaming or multimedia-intensive applications, such as photo or video editing. For the average user, both vendors provide excellent, dependable products.

Both manufacturers offer performance and value consumer processors. Right now, Intel's Pentium III and Pentium 4 performance chips

are being marketed side-by-side. Currently, there are few applications on the market that take advantage of the Pentium 4's improvements over the Pentium III, but expect this to change as time goes on. Intel's value processor is the Celeron. AMD's performance processor is the Athlon and its value chip is the Duron.



The Tyan Trinity KT is Tyan's only motherboard with support for the AMD Athlon/Duron. Note the profusion of slots—six PCI, one AGP, and even one ISA. Watch out on the memory, though. This board only supports up to PC133 SDRAM.



High-end graphics users, particularly gamers, need a high-end graphics adapter. The NVIDIA GeForce3 chip, located under the cooling fan above, is the fastest gaming card on today's market.

The trouble with performance/value segregation is that the chips themselves may only have a price difference of \$100 or so, depending on speeds. The average user, given such a close comparison, will usually opt for the more robust processor. Unfortunately, many system vendors slant their entire configurations toward a performance or value audience with higher or lower RAM amounts, hard drive capacities, video cards, and so on. While a value CPU may only cost \$100 less than a performance CPU, the cost delta can mushroom to \$500 or more as the rest of the system is configured. A local dealer can help eliminate these extra variables. If you want to start with a value PC fueled by a high-speed Athlon, you should be able to do that.

Be aware that CPU purchasing revolves around the motherboard. The Intel D815BN motherboard, for example, uses the Intel 815 chipset and is designed for the Pentium III and Celeron processors. However, the D815BN will only support Celeron chips with a 66MHz bus speed, meaning that the board will only run up to 700MHz Celerons. To run today's 850MHz Celerons with 100MHz bus speeds requires a newer board like Intel's D815PEA2. If you decide that all you can afford is a 700MHz Celeron chip, that's fine, but be sure to buy a board that offers as much of an upgrade path as possible.

■ **The Workspace: RAM.** Once again, the type of RAM you can use is dictated by the motherboard's BIOS. There are three kinds of system memory in today's PCs: SDRAM (synchronous dynamic RAM), DDR-DRAM (double-data-rate synchronous dynamic RAM), and RDRAM (Rambus dynamic RAM). SDRAM is the cheapest and most common, usually coming in memory bus speeds of 100MHz or 133MHz (noted as PC100 or PC133). Ideally, this number should match the CPU's bus speed. DDR-SDRAM is very similar to SDRAM; in fact, motherboards that accept DDR are backward-compatible with SDRAM. However, DDR operates at twice the bus speed of SDRAM, hence yielding higher performance. RDRAM is a technology developed by Rambus (<http://www.rambus.com>) and backed by Intel. The format is currently specific to high-end Pentium III and Pentium 4 motherboards and is designed to yield speeds in excess of DDR, although real-life tests show mixed results.

The amount and type of memory you should buy depends entirely on your applications. Low-end users should be fine with 64MB

## Terms To Know

**AGP (Accelerated Graphics Port)**—A special graphics bus developed by Intel designed for high-speed graphics controllers.

**ATA/66 or ATA/100**—AT Attachment interface, operating at either 66MHz or 100MHz. ATA is a subset of the IDE standard. Nearly all IDE hard drives being

produced now are ATA/100 compliant, although to achieve this speed, the motherboard and data cable must also support the standard.

**bus**—The data channel connecting two components. The CPU bus, for example, connects the processor with the motherboard. The speed of the bus has a large effect

on the overall speed of the component behind that bus.

**chassis**—The computer's steel/plastic enclosure.

**PCI (Peripheral Component Interconnect)**—A motherboard bus channel used to link and control peripheral devices, particularly add-on cards.

of SDRAM. High-end users will want to go straight to 256MB or higher of DDR or RDRAM, depending on their choice of AMD or Intel platforms.

Typically, we find that a user's RAM needs double every one to two years. You may want to double your memory at the point of system purchase if you want to save yourself future upgrade trouble.

Remember upgradeability. Motherboards come with two to four memory slots. If your board comes with two and you order 64MB of memory, how does that memory get configured? If the vendor installs a single 64MB module, you have one slot left for future upgrades. However, the vendor might save a few dollars by installing two 32MB modules, still giving you 64MB but filling all your RAM slots. Now, if you want to upgrade beyond 64MB, it will mean removing one of the modules you've already purchased. Try to leave two RAM slots available for future expansion whenever possible. Also, if you want to begin with SDRAM today, make sure your motherboard will support DDR-SDRAM for tomorrow.

#### ■ Long-Term Memory: Hard Drive.

Computer salespeople always hear shoppers say, "Oh, I'll never need all that hard drive space." Almost always (and contrary to common wisdom), the customer is wrong. Most users hold new applications, digital music and video files, e-mail attachments, and other space-sucking information, consuming many gigabytes in short order.

Buy the biggest drive your budget will allow. You'll find that drive prices begin to rise steeply at the upper end of the storage spectrum, but prices vary only a few dollars between capacities throughout the low- and mid-range drives. Assume that whatever you purchase will eventually get used.

You may still run into some IDE (Integrated Drive Electronics) drives using the ATA/66 specification. Avoid these and go straight to the faster ATA/100. Power users should aim for drives with 7200RPM (rotations per minute) spin rates versus the older 5400RPM spec. Business users may need SCSI hard drives for their servers, but consumers don't. IDE is just as fast for nearly all applications and considerably less expensive. Stick with reputable brands like Western Digital (<http://www.wdc.com>) and Maxtor (<http://www.maxtor.com>). Many dealers consider IBM's DeskStar series

<http://www.ibm.com>) to be the best IDE hard drive on the market.

■ **The Body: Chassis.** Vendors have found increasing numbers of ways to shrink the chassis size, including smaller motherboards and half-height PCI cards in the ongoing effort to design more attractive and less obtrusive computers. However, one of the most common ways to decrease chassis size is to eliminate drive bays.

Small chassis size is no problem for a network station. Most peripherals are accessible through the server. But on a standalone desktop



Proprietary PCs, such as this IBM NetVista 40X, may be long on good looks and space-saving design, but replacing parts can be a nightmare.

PC, a dearth of bays often spells trouble down the road. If you fill your hard drive and want to add another, you'll need an empty 3.5-inch internal bay. Let's say you want to add a recordable DVD drive: You'd better have an empty 5.25-inch external bay ready for it. Also note that your chassis needs to accept full-height PCI cards if the add-on PCI cards you want only come in full-height designs.

A current trend in PCs is to rely on universal ports like USB (Universal Serial Bus) and IEEE 1394 (Institute of Electrical and Electronic Engineers 1394 or commonly referred to as FireWire) to add peripherals. Unfortunately, external drives cost more and often deliver slower performance than internals. So get plenty of empty bays if you plan on upgrading.

#### ■ Painting The World: Video Adapter.

There are two ways to handle video: directly from the motherboard or through a plug-in adapter card. Budget PCs often use motherboard

chips capable of handling 2-D and 3-D video directly. A VGA (Video Graphics Array) port cables out from the motherboard with no intervening card. Integrated video is fine for productivity applications. Typically, the video system robs a few megabytes from system RAM, but the effect is negligible. The approach is insufficient for graphics applications and gaming.

Mainstream and power users will want AGP (Accelerated Graphics Port) adapter cards based on video chips from vendors like NVIDIA (<http://www.nvidia.com>) and ATI (<http://www.atl.com>). Standard cards will offer 16MB or 32MB of dedicated video memory, while high-end cards for gaming frequently have 64MB of DDR memory and cutting-edge video chips. Low-end systems may still come with 8MB video configurations.

#### ■ The Multimedia Source: Optical

**Drives.** Even more so than floppy diskette drives, CD-ROM functionality is pervasive throughout new PCs, if only as a means to install software. If your CD needs are minimal, a standard, high-speed CD-ROM unit costs less than \$50. However, CD-RW (CD-rewritable) drives, which also perform the function of a CD-ROM, have now dropped to less than \$150, and CD-compatible DVD-ROM drives hover around \$100. You'd do best to skip over the CD-ROM and buy one of the more multi-purpose solutions if you're looking to configure a system with minimum components but maximum utility.

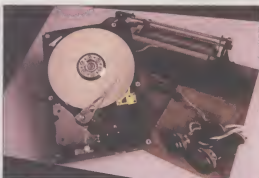
CD-RW has emerged as the backup method of choice for most users, not to mention the panacea for anyone who longs to create custom music compilations. The specification to watch for in CD-RW drives is BURN-Proof technology, which eliminates the buffer underruns that cause recording hiccups and useless coaster CD-R (CD-recordable) discs. BURN-Proof is found in newer high-speed models, and you can expect to pay at least \$200 for a compliant drive, but it's a solid investment.

For maximum functionality, we recommend a DVD-ROM with a CD-RW drive. That said, if you want to perform CD burning at speeds faster than 4X or 8X, you'll need a CD-ROM drive with digital extraction rates in excess of your CD-RW's recording speed. Digital extraction speeds are significantly lower than a drive's rated read speeds, so be cautious and read the fine print.



■ **The Voice: Sound & Speakers.** There are three levels of sound cards, the component that helps generate the sounds that emerge from your PC's speakers. Once again, sound can be integrated into chipsets, and the latest chipsets even support multi-channel surround sound. (Beware of older chipsets that only handle two-channel stereo.) A small step above this is an entry-level PCI card like Yamaha's \$20 Wave 3D (<http://www.yamaha.com>), but you'll find little functionality that current chipset solutions don't offer. The real name in sound cards is Creative Labs and its Sound Blaster Live! family of cards (<http://www.soundblaster.com>). Sound Blasters come geared for low-end gamers up through MIDI (Musical Instrument Digital Interface) musicians. Creative's support and options are excellent and their cards have an impeccable track record.

Speakers can be a more difficult decision, and you really need to let your ears guide you. To just hear the sounds of Windows and perhaps speech, any \$10 set of tinny speakers will do. But in the \$50 to \$100 range, the gap in sound quality has significantly narrowed. In this range you can find very good three-piece sets (two satellites and a sub-woofer) or moderate five-pieces (four satellites and sub). Above \$100, you find 5.1 sets designed for stunning, audiophile-level Dolby Digital playback. Look at familiar names like Altec Lansing (<http://www.alteclansing.com>) and Creative Labs (<http://www.creative.com>). Also don't overlook smaller brands like Labtec (<http://www.labtec.com>),



**IBM's DeskStar series is one of the fastest, most durable hard drives on the market. You'll pay a premium for IBM drives, but most users find the extra money well spent.**

which has inexpensive models with surprisingly big sound. When possible, we recommend buying a wood enclosure sub-woofer over plastic, as we've found the sound to be considerably richer.

■ **The Interface: Operating System.** Common sense might say to buy the newest version of Windows on the market, but experienced users often testify that the first release of any new Windows version will be buggy. Best to wait for the first major version revision. (Keep this in mind for when Windows XP, the biggest overhaul since Windows 95, hits the streets.) For consumers, Windows Me is now the OS of choice. It's stable, simple, and almost universally supported by the PC industry. You might find Windows 98 offered for a few dollars less; we suggest still opting for WinMe.

Be careful to find out which OS (operating system) comes pre-installed on the machine if

you're shopping for the lowest price at local dealers. Some dealers are now bundling versions of Linux rather than Windows because Linux is free and WinMe roughly adds \$100 to the system cost. The dealer may shrug and say, "So go find a copy of Windows and install it." Illegals aside, most users will have a far better experience and save many precious hours by paying to have the system properly preconfigured out of the box.

■ **Final Advice.** In the end, that's the No. 1 lesson for PC buying: Pay the extra. If you get two years of satisfaction from a \$1,000 PC, figure that's \$500 per year. But if you get three years of use from a \$1,200 box, isn't that worth the premium? Think about the system's suitability to your needs both today and 12 months from now.

The most common source of discontent among PC buyers is finding that, three months after acquisition, a better configuration can be had for hundreds of dollars less. Expect this. You can always wait for the prices to drop, but you may find yourself waiting forever. Just accept that you will buy what you need when you need it. You'll be much closer to making the perfect PC purchase with this in mind. [65]

by William Van Winkle

(NOTE: Visit <http://www.smartcomputing.com/guide/0907/PCBuying> to read the "Seeing Into The Future" and "The Expert Opinion" sidebars.)

## Snapshot: The Killer Questions

**W**e've covered a lot of ground. At a glance, here are the top questions to ask your sales rep and the answers you want to hear.

**Q: If my motherboard fails, where can I buy a replacement?**

**A:** "Anywhere" is what you want to hear. You want an industry standard form factor, such as ATX or microATX. Name brand configurations change so quickly that if your motherboard is proprietary and you need to procure a

replacement from the manufacturer, you may find that the necessary board is no longer available.

**Q: What hard drive are you using?**

**A:** Look for industry-leading names like Western Digital, Maxtor, and IBM. Seagate's SCSI (Small Computer Systems Interface) drives are top-notch, but their IDE (Integrated Drive Electronics) drives have a long history of spotty performance. Occasionally, a glit of

super-low priced drives will flood the market. Avoid these as they typically are of inferior quality and made by companies that quickly disappear.

**Q: How many empty drive bays are in the case?**

**A:** You want at least two, one 3.5-inch and one 5.25-inch. Two of each is better. Most "mid tower" designs will accommodate this layout.

**Q: What video card are you using?**

**A:** For mainstream and higher systems, make sure you're

getting a video card (AGP, not PCI) and not video integrated in a motherboard chipset. If you need graphics performance, rely on cards using NVIDIA's newest GeForce chips (GeForce2 or GeForce3) or even a slightly slower performance card like ATI's Radeon.

**Q: What OS is installed?**

**A:** Unless you're a Linux user, it better not be Linux, and unless you're adventurous, it shouldn't be the first release of a new Windows edition. □





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# Inside A PC

It's no surprise that home PCs have become more complex; there's simply more stuff to put in them. Under the hood, you'll still find basic PC components such as the CPU and memory, but today's PCs are

also likely to have newer gadgets such as a DVD drive and IEEE 1394 ports. Let's take a look inside Gateway's Performance 1500XL, a PC that's loaded with the latest hardware.

**1 CPU**—This is a computer's most important piece of hardware. The more powerful the CPU is, the faster your system will run. Today's processors run at 1.7GHz, a number that is continuing to grow rapidly.

**2 Memory (RAM)**—The PC's RAM stores several chunks of information until the system's CPU needs that information to execute some task. It's the PC's "waiting room." Most systems use SDRAM (synchronous dynamic RAM) though many new systems use either RDRAM (Rambus dynamic RAM) or DDR-SDRAM (double-data-rate SDRAM), both of which are faster than SDRAM.

**3 Hard drive**—If the RAM is the PC's waiting room, then the hard drive is your PC's file cabinet. This is where the PC stores all your information and files until you need it. Most new hard drives are from 20GB to 80GB in size. Most hard drives use the IDE (Integrated Drive Electronics) interface, although you can still buy faster (and more expensive) SCSI (Small Computer System Interface) hard drives.

**4 Graphics card**—Today's graphics cards have their own processors, or video chips, that process the PC's graphical information so the CPU doesn't have to. Graphics cards have become so powerful that they can produce stunning 3-D graphics and greatly accelerate 2-D programs.

**5 Sound card**—The sound card processes all of the sound data for the PC so you can, for example, listen to MP3s while you're using your computer. The sound card also processes all the audio data for the games and DVD movies that you play on your computer.

**6 Modem**—The modem is the traditional way to connect to the Internet. A modem dials into an ISP (Internet service provider) using your phone line.

**7 Network adapter**—Some people are beginning to use network adapters to connect to the Internet or to set up home networks. They process data much more quickly than modems can.

**8 DVD drive**—A DVD drive is basically an improved CD-ROM drive. If your computer has a DVD drive, you can watch DVD movies on your PC. Some software is also available on DVD, such as encyclopedia programs. CD-ROMs can store about 650MB of data, but DVDs can hold from about 4GB to 17GB of data!

**9 CD-RW (CD-rewritable) drive**—CD-RW drives can record information to CD-Rs (CD-recordable) and CD-RWs. CD-RW drives are excellent for backing up and archiving data and for creating your own audio CDs. New CD-RW drives use BURN-Proof technology to prevent buffer underruns and can record data at speeds up to 16X, with 16X-approved media.

**10 Floppy diskette drive**—Every computer since the 1980s has had a floppy diskette drive of some sort. Some things never change.

**11 Ports**—Ports on the back (and sometimes the front) of the PC are used to connect external devices to your PC, such as printers, joysticks, scanners, a keyboard or mouse.

**Monitor**—You'll need one of these to see what your PC is up to. 17-inch monitors have become very popular, but some new PCs come with 19-inch monitors.

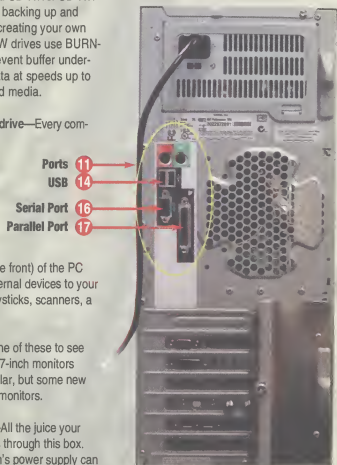
**12 Power Supply**—All the juice your PC needs comes through this box. The wattage of a system's power supply can

be from 150w to 300w or even more. 250w should be sufficient for most users.

**13 Motherboard**—A PC's motherboard is the main circuit board that all the PC's internal hardware is connected to. Most motherboards are ATX (Advanced Technology Extended) motherboards, which are smaller than previous designs. In this illustration, the motherboard is identified by the yellow box.

## Ports:

**14 USB (Universal Serial Bus)**—USB is a popular way to connect external devices to a PC. Most USB devices are slower speed devices such as mice, keyboards, and



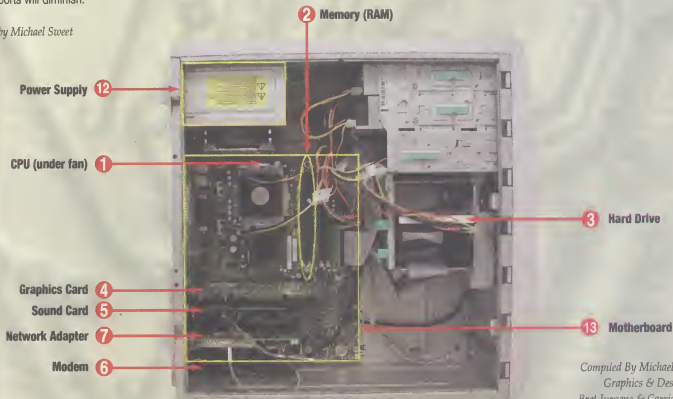
joysticks, due to USB's rather slow 12Mbps (megabits per second) data transfer rate. However, a new version of USB technology (USB 2.0) is just now coming out. USB 2.0 has a maximum data transfer rate of 480Mbps, which is more practical for high-speed devices such as external hard drives.

**15 IEEE 1394**—Called "FireWire" in the word of Apple computing, IEEE 1394 is similar to USB. IEEE 1394 has a maximum data transfer rate of 400Mbps, and you can connect up to 63 IEEE 1394 devices at one time. Many new systems have both USB and IEEE 1394 ports.

**16 Serial**—This is the tried and true port for very low-speed devices such as mice and keyboards. USB will likely make serial ports obsolete at some point, but it may take a while.

**17 Parallel**—Printers and external drives often use parallel ports because they transfer data more quickly than serial ports. However, as USB and IEEE 1394 devices become more popular, the need for parallel ports will diminish.

by Michael Sweet



Compiled By Michael Sweet  
Graphics & Design By  
Bret Jurgens & Carrie Benes

# The Best Of The Bottom Shelf

## Sub-\$1,000 Systems That Could Be A Perfect Fit

New computer systems depreciate unbelievably quickly. There's just always something flashier around the corner. The sunny side of this is you don't have to spend more than \$1,000 to get a functional, powerful PC with several extras.

Despite some skepticism of PCs in this price category, these PCs can perform almost any task you want. Unless you're an avid gamer or Photoshop user, one of these PCs might do everything you need.



The Dell Dimension L1000r cleaned up in our benchmark tests.

**■ How We Tested.** Besides poking around inside each PC's chassis as a potential upgrader would, we played with each system to gauge its pros and cons. At this price level, you should pay attention to software bundles and warranty terms, which can affect each PC's value.

We also used MadOnion's SYSmark2000, Video2000, and 3DMark2000 benchmarking software to gather hard numbers for a more objective comparison. Finally, we cut loose with 3-D video games such as Quake III: Arena and Half-Life to help translate those cold benchmarking scores into real advice in plain English.

### Dell Dimension L1000r

It seems Dell took the money it saved making the Dimension L1000r (\$999; 800/999-3355, 512/338-4400; <http://www.dell.com>) pretty and spent it on performance parts. A hot 1GHz Intel Pentium III, 128MB of SDRAM (synchronous

dynamic RAM; 512MB maximum), and a 100MHz system bus add some fire to an otherwise plain beige mid-tower.

Further fueling this businesslike Dell's fire is a 7,200rpm (revolutions per minute), 20.5GB Quantum hard drive. Compared to typical 5,400rpm drives, a 7,200rpm model noticeably increases how fast a system "feels." However, Dell had to include the 48X CD-ROM drive rather than a CD-RW (CD-rewritable) or DVD drive to squeak this PC in under \$1,000.

Like the plain keyboard, the Dell's sharp 15-inch monitor does its job well. The Logitech wheel mouse is a concession to comfort. There are two rear USB (Universal Serial Bus) ports on the L1000r, along with the obligatory 56Kbps (kilobits per second) modem and diskette drive. We also liked the dual Harman/Kardon speakers' headphone jack and volume and tone controls, even if the Gateway Essential 933's speakers sounded better.

Dell chose Intel's integrated 82810E AGP (Accelerated Graphics Port) graphics chipset. It's not serious enough for 3-D gaming but fine for anything else. The problem is that 3-D upgrades on any of these systems are limited to PCI (Peripheral Component Interconnect) cards, which are disappearing.

Predictably, this 1GHz powerhouse cleaned up in our benchmark tests. The L1000r comes with great software such as Microsoft Works Suite 2001, Money 2001, and Picture It! Publishing 2001.

It would be easy to add RAM (one slot free) or an Ethernet PCI card

(two slots free) to this Dell. For a home/business system at this price, though, we would take the Dimension L1000r as is. It stands apart with a three-year, in-home service warranty and lifetime phone tech support.

### Gateway Essential 933

Gateway took a different approach to building a sub-\$1,000 computer. It focused on pleasing the user with a bigger display, richer sound, and speed you can feel. There are a few trade-offs in the Essential 933 (\$999; 800/846-4208, 605/232-2000; <http://www.gateway.com>), but we enjoyed our time with it.

This Gateway has a 933MHz Pentium III and 128MB of SDRAM (512MB maximum). These numbers get even better when you factor in a 133MHz system bus speed, which helps account for the seat-of-the-pants performance boost over the HP, Sony, and IBM. Gateway houses all of this in a compact desktop case.

Gateway's 17-inch EV700 monitor pleased us more than its rivals' 15-inch displays. It's even a little sharper than the others, excepting the Sony, if not crystal-clear. The twin Boston Acoustics speakers sound richer than the HP's tiny units and share a volume knob. Just after this review, we learned that Gateway switched to Cambridge Soundworks GCS300 speakers.

The Essential's Millennium keyboard has CD controls and programmable function keys. It adds a sixth USB port to the two on the front of the Essential's case and the three in the back.

As with the Dell and IBM, the CD-ROM instead of a CD-RW drive limits this Gateway somewhat. If you feel like adding an extra hard drive or CD-RW, buy a USB external version.

As for internal upgrades, this Gateway's slim-line design makes it tough to add RAM to the single unused DIMM (dual in-line memory



The Gateway Essential 933's high SYSmark2000 rating and Video2000 score demonstrate what a faster processor and system bus can do.

module) slot. It's easier to reach the two free PCI slots, but you'll have to buy PCI card devices with special low-profile brackets.

The Essential's relatively high SYSmark2000 rating and Video2000 score demonstrate what a faster processor and system bus can do. And although the Essential uses the same Intel 82810 integrated 3-D chipset as its rivals, Quake III was very playable on it at 512 x 384 resolution.

This Gateway includes MS Works Suite 2001, Norton Antivirus 2001, and other software. It has a one-year warranty.

### HP Pavilion BG838

Only about two years ago, the BG838 (\$799; 888/999-4747, 650/857-1501; <http://www.hp.com>) would have been a killer performance package. Its 800MHz Celeron processor, 100MHz

system bus, 128MB of SDRAM (512MB maximum), and big 30GB hard drive still sound pretty good today, especially with an \$899 price tag. Its HP CD-Writer Plus 8X/4X/32X (write/rewrite/read speeds) CD-RW drive sweetens the deal, but the Sony VAIO J150-A100/L has one, too.

BG838 is actually the model number of a bundle combining the XG838 Pavilion and a 15-inch MX50 monitor. This Pavilion doesn't take up

## By The Numbers

	Dell Dimension L1000r	Gateway Essential 933	HP Pavilion BG838	IBM NetVista A20i	Sony VAIO J150-A100/L
Price	\$998	\$999	\$799	\$967	\$899
Operating System	Windows Me	Windows Me	Windows Me	Windows 2000 Professional	Windows Me
Processor	1GHz Pentium III	933MHz Pentium III	800MHz Celeron	733MHz Celeron	800MHz Duron
Bus Speed	100MHz	133MHz	100MHz	66MHz	200MHz
RAM	128 MB SDRAM	128MB SDRAM	128MB SDRAM	256MB SDRAM	64MB PC 133 SDRAM
Graphics Accelerator	Intel 82810E (integrated)	Intel 82810 (integrated)	Intel 82810 (integrated)	Intel 82810 (integrated)	SiS 300 (integrated)
Video RAM	4MB (shared)	Up to 11MB (shared)	Up to 11MB (shared)	Up to 8MB (shared)	up to 16MB (shared)
Optical Drive	48X CD-ROM	48X CD-ROM	8X/4X/32X CD-RW	48X CD-ROM	8X/4X/32X CD-RW
Hard Drive	20.5GB	20.4GB	30GB	10.2GB	30GB
Monitor	15-inch Dell E551	17-inch Gateway EV 700	15-inch HP MX 50	15-inch IBM E51	15-inch Sony Trinitron
Sound Card/Speakers	Creative Sound Blaster 64V PCI / 2 harman/kardon	AC Link 3D / 2 Boston Acoustics BA 265	Crystal WDM (integrated) / 2 Polk Audio	AC 97 integrated audio / no speakers	AC 97 integrated audio / 2 Sony
Connectivity	56Kbps modem	56Kbps modem	56Kbps modem	10/100 Ethernet with Alert-on-LAN	56Kbps modem, 10/100 Ethernet
Chassis Type	Mid-tower	Mini-desktop	Mini-tower	Mini-desktop	Mid-tower
System Type	Personal Use/Business	Personal Use/Business	Personal Use/Home Office	Business	Personal Use
SYSmark2000 Overall	158	131	104	118	94
SYSmark2000 Office Productivity	147	120	93	110	93
SYSmark2000 Internet Content Creation	174	148	120	129	94
Video2000 Video Marks	1,519	1,369	1,148	1,073	1,434
Video2000 Quality	571	550	517	517	596
Video2000 Performance	579	449	262	188	410
Video2000 Features	369	369	369	369	428
3DMark2000	1,250	879	832	813	N/A
Manufacturer	Dell	Gateway	Hewlett-Packard	IBM	Sony
Final Word	Raw power and no nonsense	Bigger monitor and nicer sound; great performance, too	CD-RW and a big hard drive; trails the pack, though	Straight business system, but costs a lot for what you get	Wild card with a Duron processor; nice home PC but needs RAM



The IBM NetVista A20 is all business.



Courtesy of International Business Machines Corporation. Unauthorized use not permitted.



The Sony VAIO J150-A100/L has the only AMD processor in this roundup.

much space, but despite the compactness of its mini-tower case, it's not difficult to reach its two free PCI slots to add an Ethernet card for a DSL (Digital Subscriber Line) or cable modem connection, for example. For now, the Pavilion's included 56Kbps Lucent WinModem handles dial-up Internet duties. Meanwhile, twin USB ports on the back panel await future peripherals.

The BG838's keyboard has more function buttons than we would expect. However, its diminutive Polk Audio speakers are manifestly budget models without a volume knob. Also, the 15-inch monitor didn't have a very sharp display.

This Pavilion's scores fall near the bottom of this category, but remember we're still talking about more processing power than you'll likely need. With its integrated Intel 82810 AGP 3-D graphics circuitry, the BG838 obviously isn't a hardcore gaming system, but most non 3-D games, such as *The Sims*, should work fine on it.

Among its numerous software titles are Roxio's Easy CD Creator, ArcSoft's My Photo Center, MS Works, and Money Standard 2001. It has a one-year limited warranty.

## IBM NetVista A20

The NetVista A20 from IBM is all business (\$967; 888/746-7426, 914/765-1900; <http://www.ibm.com>). Without speakers or a large hard drive, it's not really meant to compare to the home and home office systems in this article. Still, it's network-ready with a 10/100Mbps (megabits per second) Ethernet card and Alert-on-LAN (local-area network) capability. It also comes with Windows 2000 Professional.

The A20 gets its power from a 733MHz Celeron with a 66MHz system bus. Rather than switching to a 100MHz or 133MHz motherboard, IBM chose to boost the A20's performance with double the typical RAM. 256MB seems excessive in a system not intended for graphics or photo work, but it does help the A20's low-end processor and system bus save face, even giving the 800MHz HP some stiff competition. Big RAM also means the A20 can run many applications simultaneously, as business environments often demand.

Despite its \$967 price tag, the A20 has few amenities. Less than 9GB of its 10.2GB hard drive is usable, as IBM put recovery files on the drive rather than on CDs. The 15-inch E51 monitor is colorful, if not crisp; the keyboard has a wrist rest, if no programmable hotkeys; and the two-button mouse has no scrolling wheel. This IBM is light on software, as well, with Utility Manager, Configuration Safe EZ, PC Doctor, and little else.



The HP Pavilion BG838 is attractive and functional.

As with the Gateway, any PCI cards you add to the A20's two free slots must be low-profile. Its 48X CD-ROM drive is par for the course.

The A20's advantages over the other semibusiness PC in this roundup, the Dell L1000r, are its Ethernet card, extra 128MB of RAM, and Windows 2000. But we can't ignore that the Dell offers much better performance and twice the hard drive space for another \$31. IBM backs the A20 with a three-year parts/one-year on-site labor warranty.

## Sony VAIO J150-A100/L

Finally, we're starting to see AMD's Duron processors competing in inexpensive PCs. Unfortunately, with only half the RAM of most other systems reviewed here, this Duron desktop doesn't get a fair comparison to Celeron and Pentium III systems.

Sony's VAIO J150-A100/L package (\$899; 888/476-6972; <http://www.sonystyle.com>) includes a VAIO PCV-J150 computer with a nice 15-inch Trinitron display. The VAIO combines an 800MHz Duron processor, a 200MHz system bus, and a modest 64MB of SDRAM (512MB maximum) for mixed performance numbers. Its SYSmark scores trail the pack, but its Video2000 scores beat anything short of the 1GHz Pentium III Dell. Memory concerns kept us from running the same version of 3DMark2000 on the VAIO as we did on the other systems. Also, its integrated SIS 300 graphics core doesn't support 3-D, so our Quake gameplay wasn't much fun.

The VAIO's 8X/4X/32X CD-RW drive and 30GB hard drive set it squarely against HP's Pavilion BG838. Even with 128MB of RAM, the only contest the HP wins is SYSmark's Internet Content Creation by 26 points (and thus SYSmark overall). The Sony trumps the HP with both a 56Kbps modem and a 10/100Mbps Ethernet card. In addition, its astounding eight USB ports and single iLink port offer more expansion possibilities beyond its two free PCI slots.

Sony may also win the software bundle war.

Besides a long list of Sony audiovisual titles, the VAIO includes Corel WordPerfect, McAfee Virus-Scan, Quicken 2001 New User Edition, Roxio Easy CD Creator and Direct-CD, and more. If only this VAIO had more RAM. It does have a one-year limited warranty, one year of hardware phone support, and 90 days of software phone support.

■ **Final Word.** For home use, gamers and DVD lovers won't find much to like about this category. However, the Sony and HP both offer CD-RW drives and great software packages for \$899. For businesses, the Dimension's raw performance for the money makes it the best bet. If you're willing to give up a little processing power for a larger display and better audio, the Gateway Essential 933 is the one to pick. [E]

by Marty Sems

# A Step Up On The System Ladder

## Decent PCs From \$1,000 To \$1,499 That (Probably) Have What You Need

**Y**our patience has been rewarded. You waited long enough for 1GHz computer prices to fall below the \$1,500 mark, and you're ready to shop for a new PC. You're not inclined to spend a lot of money on a bleeding-edge monster machine, but you're steering clear of the commodity aura of sub-\$1,000 PCs.

Home and small-office computers in the \$1,000 to \$1,500 category tend to combine relatively high performance with extras such as CD-RW (CD-rewriteable) drives, 3-D graphics accelerators for CAD (computer-aided design) work or games, and/or DVD-ROM (digital versatile

disc ROM) drives. But each has its compromises. Some have very little upgradability. Others sacrifice video and audio improvements for other benefits. As long as you don't foresee a need for such items as IEEE (Institute of Electrical and Electronic Engineers) 1394 ports or the hottest 3-D video cards, you can save money by buying a PC that fits your needs right now.

little speed difference among these computers. They're all plenty fast for these duties, and even for the latest games, to varying degrees.

The fun part of testing involved using each PC as a home user or business user might. We checked into each system's included software, its upgradability, and how it looked and sounded to us. We also played Quake III: Arena for a gamer's perspective and checked out fast-moving scenes in the DVD movie "The Matrix," where applicable, to make sure the system didn't stutter.

### Dell Dimension 4100

Once again, Dell fields a PC with an understated beige case, a boxy monitor, and a standard keyboard. By now, though, we know that Dimensions such as the 4100 (\$1,449; 800/999-3355, 512/338-4400; <http://www.dell.com>) have more "go" than "show."

Although we can tell you this Dell felt fast at everything we did, we need to explain why. Starting with a 1GHz Pentium III (which can actually outperform 1.3 to 1.5GHz Pentium 4s in many tasks), Dell chose to let the processor run loose with a 133MHz system bus to the 128MB of SDRAM (synchronous dynamic RAM; 512MB maximum).

This hardware won't be left waiting for hard data, either. A 7,200rpm (revolutions per minute), 40GB Western Digital Caviar hard drive loads applications and saves documents surprisingly quickly. There's also an NEC 16X DVD-ROM drive on deck, which was more than fast enough to handle our CD-ROMs, audio CDs, and "The Matrix" DVD.

When you frame the 17-inch Dell M781s monitor with the included harman/kardon HK695 speakers, the effect is like planting roses in East Berlin circa the 1980s. The pretty harman/kardons look like champagne flutes. Although easy to topple, they sound great, especially when paired with the included subwoofer.

The 32MB DDR (double-data-rate) ATI Radeon AGP (Accelerated Graphics Port) 4X 3-D video card gave us exceptional Quake III: Arena gameplay, even at a huge 1,600 x 1,200 resolution. A solid Microsoft Intellimouse wheel mouse helped make the game controllable. The 3DMark2000 benchmarking utility gave the Dell a score of 4,727 here. This Dimension is proof that you can get a gaming and cinematic powerhouse for less than \$1,500.

In other tests, the 4100 netted a 159 SYSmark2000 rating and a 2,583 Video2000 score.



**Despite its unimpressive monitor, the Gateway Performance 1000 is our favorite system in this head-to-head review.**

The DDR memory in the Radeon card helped it beat the Gateway Performance 1000's GeForce2 MX in Video2000, but it couldn't best the GeForce2 MX in a 3-D contest.

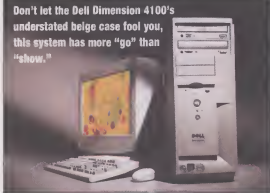
A structural bar along the 4100's left side is a minor obstacle to the three unused PCI (Peripheral Component Interconnect) slots, but you'll find it easier to reach the free DIMM (dual in-line memory module) slot. This Dell's mid-tower case has enough free bays for three more 3.5-inch drives and a 5.25-inch one. The latter would be the perfect place for a CD-RW drive later. This interior upgradability is particularly nice, as the 4100 has only two USB (Universal Serial Bus) ports.

The 4100 has a three-year hardware warranty with one-year in-home service and phone support as long as you own it. It also comes with a laundry list of good software such as Windows Me, Picture It! Publishing 2001, and Norton Antivirus 2001.

### Gateway Performance 1000

Our favorite system in this review is the Gateway Performance 1000 (\$1,489; 800/846-4208, 605/232-2000; <http://www.gateway.com>)

**Don't let the Dell Dimension 4100's understated beige case fool you, this system has more "go" than "show."**



disc ROM) drives. But each has its compromises. Some have very little upgradability. Others sacrifice video and audio improvements for other benefits. As long as you don't foresee a need for such items as IEEE (Institute of Electrical and Electronic Engineers) 1394 ports or the hottest 3-D video cards, you can save money by buying a PC that fits your needs right now.

**■ How We Tested.** Although each system had a unique roster of goodies, we could still evaluate its overall speed with objective benchmarking utilities such as BAPCO's SYSmark2000, and MadOnion's Video2000 and 3DMark2000. These benchmarks rate a PC's top processing and visual speeds for demanding applications. For most duties such as word processing, e-mail, and Web surfing, though, there's

.com). Combining an 8X/4X/32X (write/rewrite/read speeds; CD X equals 150KBps [kilobytes per second]) drive with a sweet Boston Acoustics three-piece sound system, the Performance also lives up to its name. It can't quite catch the business-only IBM NetVista A40's SYSmark2000 scores, but it tops the three home PCs in overall speed (168 in SYSmark2000).

With a 1GHz Pentium III, a 133MHz system bus, and a 7,200rpm, 40GB Quantum hard drive, this Gateway is ready to perform. It has 128MB of SDRAM with two free DIMM slots. Its maximum RAM capacity of 256MB seems low, but that's still more than enough for a home/small-business PC.

The Gateway's NVIDIA GeForce2 MX AGP 4X video card with 32MB of SDRAM loses some ground to the Dell's 32MB DDR Radeon card in the Video2000 test with 1,972 and 2,583 respective points. However, the GeForce2 MX kicks tail where it counts: the 3DMark2000 test, with 4,802 points. Quake III: Arena was as fluid as we've seen at 1,280 x 1,024 resolution, but it would not load the OpenGL driver at 1,600 x 1,200 or higher settings.

We're not so enchanted with the 17-inch EV700 monitor. Objects on-screen were sharper near the edges of the screen than in the middle, no matter how we adjusted the relevant settings. This problem was also present to a lesser degree in the EV700 included with the Essential 933, reviewed in the previous article.

Thanks to sliding levers in this Gateway's mid-tower case, you'll find it easy to open the case and replace drives. With three free 3.5-inch bays, three open PCI slots, and four USB ports (two front, two rear), this Gateway would be the simplest PC in this article to upgrade.

Besides its 56Kbps (kilobits per second) modem, our test unit had a 10Mbps (megabits per second) Ethernet port for cable or DSL (Digital Subscriber Line) Internet connections. Gateway says new Performance 1000s come with a 10/100Mbps network card, and the \$1,489 price shown here reflects this. Gateway also throws in a free year of AOL Internet service with the system.

No CD-RW system is complete without Roxio's Easy CD Creator and DirectCD. Gateway includes these and many more titles, such as MS Works Suite 2001, Norton Antivirus 2001, and MGI Video Wave 4.0. The Performance 1000 also has a three-year

limited hardware warranty with one-year, on-site service.

### HP Pavilion BT858

HP's BT858 bundle (\$1,399; 888/999-4747, 650/857-1501; <http://www.hp.com>) actually comprises a Pavilion XT858 PC and a 17-inch HP mx70 monitor. Because we're including monitors in the purchase prices of the systems in this review, we'll just refer to this HP system as the BT858.

This PC seems to have a split personality. It has the CD-RW and DVD drives home users crave, yet its outsized 192MB of SDRAM seems made for running several business applications simultaneously. A 1GHz Pentium III with a 133MHz system bus cries "gaming rig," but the PC's low-end integrated Intel graphics chipset offers only the most rudimentary 3-D gameplay—with no AGP slot for an upgrade. The



Music lovers will be pleased with the HP Pavilion BT858's CD-RW and DVD-ROM drives.



The IBM NetVista A40 underdog was more than able to hold its own among the heavyweights in this roundup.

BT858's thunderous 60GB Quantum Fireball Plus AS hard drive, and indeed the HP keyboard's CD/DVD/MP3 controls, mark this system as a paradisiacal music jukebox. Yet, HP saddles the BT858 with the same tiny, tinny Polk Audio speakers it uses in its sub-\$1,000 PCs.

You can use the BT858's 8X/4X/32X Mitsumi CD-RW drive to run your CD-ROM software, play audio CDs, and make data or music mix CD-Rs (CD-recordables). Speaking of which, that spacious 60GB hard drive looks like the Great Plains when you have a whole herd of MP3s to park. The 16X (DVD X equals 1.35MBps [megabytes per second]) Pioneer DVD-116 drive will also run your CD-ROMs and play DVD movies beautifully. Somewhat of a digital Sybil, the BT858 could be an excellent multimedia machine for your favorite tunes and flicks if it had different speakers and a subwoofer.

As always, HP loads the keyboard with programmable keys and includes a fair wheel mouse. The mx70 monitor has a built-in microphone, but its display isn't as crisp as the Dell's.

We like HP's custom of putting one of the BT858's two USB ports under a front panel, next to an extra serial port for your digital camera. However, there's only one free PCI slot. This may not matter to you so much, as HP included both a 56Kbps modem and a 10/100Mbps Ethernet card for a cable modem or DSL. Both DIMM slots are full, but the system can accept up to 1GB of SDRAM if you really need it. And with such fine optical and hard drive storage, you may never need the extra 3.5-inch drive bay.

Even with 64MB more RAM, this HP's benchmarks fall behind the others. It's the only system here still using Intel's 82810E chipset, and its Video2000 (1,228), 3DMark2000 (754), and SYSmark2000 (145) scores suffer for it. Of course, this HP is still fast enough for CD-burning, e-mail, DVD-watching, and office tasks.

The usual Roxio CD-burning software is here, as is MS Works 6.0, Money 2001 Standard, WinDVD 2000, and more. HP's one-year warranty includes 24-hour, seven-day-a-week phone support.

### IBM NetVista A40

Call it the American way, but we love to see a lean underdog take a bone from heftier hounds. IBM's NetVista A40 business PC (\$1,481; 888/746-7426, 914/765-1900; <http://www.ibm.com>) gets a better SYSmark2000 score with a 933MHz Pentium III than any of the 1GHz systems here. A 133MHz system bus, a 20.4GB hard drive, and a 256MB of SDRAM (512MB maximum) complete the picture.

You won't find home-user niceties such as CD-RW or even speakers here. The A40's Intel Pro/100 VE 100Mbps Ethernet port and Windows 2000 Professional operating system mark it for office duties. It's an ebony system with a 17-inch IBM G78 monitor and a matching mouse with a good scrolling lever. The A40's sole optical drive is a 24X TEAC CD-224E.

Despite its SYSmark2000 prowess, the A40 didn't fare so well in Video2000 or 3DMark-2000. Its integrated graphics chipset isn't bad for 3-D gaming. Even with a maximum of 4MB video memory, the Intel 82815 chipset gave us smooth Quake III: Arena frapping at 800 x 600 resolution.

The compromise for the A40's mini-desktop case is that it only has two free hard-to-reach PCI slots on a daughterboard. Also, our test system had a physical AGP slot, but the case had no corresponding rear expansion slot for monitor cable access, so you can't add a new AGP video card. The A40 does have two rear USB ports, though.

IBM gives NetVista A40 buyers a three-year parts/one-year labor warranty, with on-site service the first year. We don't like the fact that the A40's recovery software is on the hard drive rather than CD, but corporate users may prefer to resurrect a troubled NetVista over a network connection. The A40

comes with PC-Doctor, IBM Backup and Restore, and other software.

■ **Final Word.** Choosing the "best" PC from this roundup is really a matter of what you want to do with one. The IBM NetVista A40 stands alone as a great business system. For home users, we would recommend the Gateway, especially if you get it with a different monitor. Its speed and CD-RW win out over the Dell's DVD drive, although the two systems are otherwise very similar. **[E]**

by Marty Sems

## By The Numbers

	Dell Dimension 4100	Gateway Performance 1000	HP Pavilion BT858	IBM NetVista A40
Price	\$1,449	\$1,489	\$1,399	\$1,481
Operating System	Windows Me	Windows Me	Windows Me	Windows 2000 Professional
Processor	1GHz Pentium III	1GHz Pentium III	1GHz Pentium III	933MHz Pentium III
Bus Speed	133MHz	133MHz	133MHz	133MHz
RAM	128MB SDRAM	128MB SDRAM	192MB SDRAM	256MB SDRAM
Graphics Accelerator	ATI Radeon	NVIDIA GeForce2 MX	Intel 82810E (Integrated)	Intel 82815 (Integrated)
Video RAM	32MB DDR	32MB SDRAM	Up to 11MB	Up to 4MB
Optical Drive	16X DVD-ROM	8X/4X/32X CD-RW; 48X CD-ROM	8X/4X/32X CD-RW; 16X DVD-ROM	24X CD-ROM
Hard Drive	40GB	40GB	60GB	20.4GB
Monitor	17-inch Dell	17-inch Gateway	17-inch HP	17-inch IBM
Sound Card	Creative Sound Blaster Live! Value / 2 haman / kardon with subwoofer	Creative Sound Blaster Live! (WDM) / 2 Boston Acoustics Digital BA735 with subwoofer	Crystal (WDM) Audio / 2 Polk Audio	Intel 82801 BA/BAM AC 97
Speakers				Intel Pro/100 VE 100Mbps
Connectivity	56Kbps modem	10/100Mbps Ethernet; 56Kbps modem	10/100Mbps Ethernet; 56Kbps modem	Ethernet
Chassis Type	Mid-tower	Mid-tower	Mini-tower	Desktop
System Type	Personal Use/Home Office	Personal Use/Home Office	Personal Use/Home Office	Business System
SYSmark2000 Overall	159	168	145	171
SYSmark2000 Office Productivity	146	155	134	164
SYSmark2000 Internet Content Creation				
Video 2000 Video Marks	179	186	162	181
Video2000 Quality	2,583	1,972	1,228	1,185
Video2000 Performance	1,032	794	570	538
Video2000 Features	1,021	696	289	279
3DMark2000 3Dmarks	530	481	369	369
Manufacturer	4,727	4,802	754	900
Final Word	Dell Solid choice for home/business apps, games, and home theatre	Gateway Best blend of speed, audiovisual muscle, connectivity, and CD-RW	Hewlett-Packard Nice list of features, but strange lack of speed; not a gamer's machine	IBM Brisk business system with ground-pounding SYSmark scores



# PCs With Attitude

## Powerful Specs From \$1,500 To \$1,999

**B**eing interested in the systems we reviewed for this price category says something about the kind of person you are. These systems are for people who need a little bit more power than most users, but aren't quite willing to embrace full-fledged digital hedonism. These systems give you all the features you need while letting you retain some degree of self-restraint.

The systems in this price range are well balanced. They are loaded with powerful hardware. All the systems in this review have Intel or AMD processors in excess of 1GHz, all have DVD and CD-RW (CD-rewritable) drives, all have 128MB of advanced system RAM, all include at least a 17-inch monitor, and all have at least 40GB hard drives. Yet they won't suck your wallet completely dry. Let's look at four of the best systems in the \$1,500 to \$1,999 price range.

### Dell Dimension 8100

The Dell Dimension 8100 (\$1,787 with monitor; 800/999-3355, 512/338-4400; <http://www.dell.com>) has several nice features and can be



customized to fit into the budgets of most users. Let's take a quick look at exactly how the system we tested was outfitted.

The Dimension 8100 uses the Windows Millennium Edition operating system and is powered by a 1.3GHz Intel Pentium 4 processor. Because the Dimension 8100 uses a Pentium 4 processor, the system has 128MB of upscale RDRAM (Rambus dynamic RAM) rather than run-of-the-mill SDRAM (synchronous dynamic RAM). You can add up to a full gigabyte of RAM to this system.

Many systems today are using an NVIDIA graphics chip or card of some kind, and that's

true of the Dimension 8100. However, users can opt to have an ATI Radeon DDR graphics card installed, and that's what we tested in this system. The Radeon DDR uses 32MB of DDR-SDRAM (double-data-rate synchronous dynamic RAM). This system also came with a nice 19-inch M991 monitor.

The Dimension 8100 uses Creative Labs wildly popular Sound Blaster Live! Value sound card with an attractive looking and nice sounding three-piece speaker system from Harmon Kardon. The Dimension 8100 puts that audio and video power to good use with a 16X DVD/12X8X32X CD-RW combo drive. This Dimension 8100 also has a 40GB hard drive, which seems to be typical for a PC in this price range.

The Dimension 8100 wasn't quite as robust as the other systems in our benchmark testing, but it still posted respectable overall numbers. The SYSmark2000 test results turned out to be the Dimension 8100's weak point. The overall SYSmark2000 score was 143, which is quite a bit lower than the results posted by all of the other PCs in this review. The system also had the lowest Office Productivity and Internet Content Creation scores, at 125 and 170, respectively. The Office Productivity number is especially low.

The Dimension 8100 gained some ground in the other tests, especially the Video2000 total score of 2,057, which was the second-best among all systems in this review. The Dimension 8100's 3DMarks score of 4,759 was third among our systems, being edged out by the Gateway Select 1300CL system by just a few points.

We wrapped up our testing by watching a DVD, playing a game (Quake III), and listening to a few audio CDs on the Dimension 8100. Some would say we're merely fiddling around at this point, which is more or less true. But we're fairly certain that you'll be using your PC for more than spreadsheets and e-mail, so we thought we'd better check out the fun side of these PCs as well. This system

has great multimedia features. The DVD was excellent both in terms of video and sound. The video game ran very smoothly, even at higher resolutions, and the audio CDs sounded pretty good.

If you're looking for a well-rounded multimedia PC, the Dimension 8100 is a good choice. It's not quite as solid as the other systems in this review at running office applications but will still get the job done in that capacity. Overall, this is a good system for the money.

### Gateway Select 1300CL

The Gateway Select 1300CL (\$1,694 with monitor; 800/846-4208, 605/232-2000; <http://www.gateway.com>) has a little bit of everything that's good: excellent hardware under the hood, good test results, and a very reasonable price. In fact, this is the least expensive system in this review (when factoring in the price of the monitors), yet it had the best overall performance. You can't top that.

The Gateway Select 1300CL uses a 1.3GHz AMD Athlon processor and runs the WinMe operating system. This PC has 128MB of fast DDR-SDRAM, which you can increase to a total of 1.5GB of RAM.

The Select 1300CL uses a video card based on NVIDIA's GeForce2 MX graphics chip. The card has 32MB of SDRAM, which should be sufficient for most users. The Select 1300CL includes a 19-inch EV910 monitor. Like the Dell Dimension 8100, this system uses Creative Labs' Sound Blaster Live! Value sound card. This system includes a three-piece set of Boston Acoustic speakers.

The Select 1300CL is equipped with a 16X DVD-ROM and a 40GB hard drive. The system we tested also had an 8X4X32X CD-RW drive, but shortly before we went to press Gateway informed us that they were replacing that option with a 12X8X32X CD-RW drive.

The Gateway Select 1300CL smoked the competition in the SYSmark2000 benchmark



Gateway Select 1300CL



## Hewlett-Packard Pavilion 7875



tests. The system's Overall score of 194 was the best by far. The Gateway PC also had the highest Office Productivity score of 181 and the highest Internet Content Creation score of 213.

The Select 1300CL didn't fare quite as well in our Video2000 testing, although it did well enough. The Select 1300CL finished third with a total score of 2,053, which was a mere four points behind the Dell Dimension 8100. The Select 1300CL finished second in the 3DMark2000 test with a total score of 4,791. However, this was still considerably less than the Micron Millennia's score of 6,684.

We took a first-hand look at the Select 1300CL's multimedia abilities, and we were generally pleased with the results. We'd occasionally see just a tiny flicker or jiggle in the video, but nothing to get really worked up about. There was very little lag in Quake III even when we turned up the game's resolution. And the sound during both the DVD and the game was quite good. The audio CDs sounded OK, but we preferred the Harmon Kardon speakers that came with the Dell system a bit more.

We'd buy the Gateway Select 1300CL if we were buying a PC in this price category today. It's a versatile system that will satisfy home office users, multimedia lovers, gamers, and casual users alike. Its overall performance is very good, and the price is a bargain when you compare it to similarly equipped systems. The Select 1300CL is our top choice in this review.

### Hewlett-Packard Pavilion 7875

Hewlett-Packard's Pavilion 7875 (\$1,998 with monitor included; 888/999-4747, 650/857-1501; <http://www.hp.com>) is the most expensive system in this review when you figure in the cost of the monitor. The system is a little pricey compared to the other systems in this review, but the Pavilion 7875 posted some nice numbers in our tests.

Like the previous two systems we've reviewed, the Pavilion 7875 uses a 1.3GHz processor, this one being of the AMD Athlon variety. The Pavilion 7875 uses WinMe and has 128MB of DDR-SDRAM, which you can increase to a total of 1GB.

Like the Gateway Select 1300CL, the Pavilion 7875 uses a graphics card based on NVIDIA's GeForce2 MX graphics chip and has 32MB of SDRAM. Hewlett-Packard sent a 17-inch monitor with the system. We did feel that HP cut

corners a little bit with the sound. This PC has an integrated Crystal audio chip and uses two Polk satellite speakers. The speakers are fairly large and deliver decent sound, but the other systems included subwoofers, which improves the sound quality significantly.

Although Hewlett-Packard didn't go all out on the sound hardware, it does give you a lot of room in which to store your data: to the tune of an 80GB hard drive. That is a big fat locker for all of those MP3 files and video clips that you just can't part with. The Pavilion 7875 also has a 16X DVD drive and an 8X4X32X CD-RW drive.

The test results for this system were on par with Gateway's Select 1300CL, although the 3-D test did not go especially well

### Micron Millennia Max XP2



for this system.

The Pavilion 7875's overall SYSMark2000 score was 179, just edging out the Micron system. The Office Productivity score of 163 was only the third best, but the Internet Content Creation score of 203 is very good, coming in just behind the Select 1300CL system.

The Pavilion 7875 cleaned up in the Video2000 test with an overall score of 2,500. This score was way higher than any other system. However, the Pavilion 7875 ran out of steam during the 3-D test. The 3DMark2000 score was only 4,428, which is dead last.

The 3-D score for this system may be somewhat low, but it didn't affect our Quake III test very much. The video ran as smoothly as it did on the other systems, even at higher resolutions. The DVD video was also good, with no jitteriness or dropped frames. However, the two-speaker setup is not really worthy of DVD. The sound wasn't bad, but the other PCs we tested clearly have superior audio hardware.

The Pavilion 7875 would make a good home office PC that can pull double-duty as a family computer. It's great with 2-D applications, and it's suitable for multimedia purposes. We think the system's price is a little high for what you get, though.

### Micron Millennia Max XP2

Micron's Millennia Max XP2 (\$1,788; 888/719-5031, 208/893-3434; <http://www.micronpc.com>) is very similar to the other systems we've reviewed, but seems to place a little more emphasis on multimedia computing. We really like the hardware Micron installed under this system's hood.

The Millennia Max XP2, like all the other systems in this review, uses the WinMe operating system. This system's 1GHz AMD Athlon processor is just a bit slower than the other systems in our review, although that doesn't seem to have affected its overall performance very much. The Millennia Max XP2 has 128MB of DDR-SDRAM. You can kick up the memory to 2GB, which is more RAM than you can shake a circuit board at.

Micron really loaded up the graphics capabilities in this test system. The Millennia Max XP2 we reviewed has an NVIDIA-based GeForce2 GTS graphics card with 64MB of DDR-SDRAM. That's an excellent way to stuff a system's AGP slot, and this system's 3-D scores reflect this graphics card's 3-D power. The system we reviewed also came with a 17-inch monitor. The Millennia Max XP2 uses Creative Lab's Sound Blaster Live! Value sound card and pairs it with a nice three-piece set of Altec Lansing speakers.

Inside the case, the Millennia Max XP2 is fitted with a 40GB hard drive. Like the other systems, this one has a 16X DVD drive. Micron includes a speedy 12X10X32X CD-RW drive so you can burn your CDs in a flash.

The Millennia Max XP2's test results varied considerably. The SYSMark2000 results were about average, the Video2000 results were low, and the 3DMark2000 results were by far the best. Here are the official numbers.

The Millennium Max XP2's Overall score in the SYSmark2000 test was 178, just behind the Pavilion's score. The Office Productivity score was 169, and the Internet Content Creation score of 190 is acceptable.

The system's Video2000 score was only 1,830, which is the least among all systems we tested. But the Millennium Max XP2 made up for this in the 3DMark2000 test, with a total score of 6,684—far above the next closest system.

The test results suggest that Micron's Millennium Max XP2 is tilted toward gamers,

and our Quake III experience reinforces that. Quake III ran more smoothly on this system than any other system we reviewed, and that's saying a lot. The DVD's video was top-notch, and the Altec Lansing speakers proved to be good as well.

If you want a good multimedia system, the Micron Millennium Max XP2 is tough to beat. It's not as solid running 2-D applications as a couple of other systems, but the Millennium Max XP2 would also make a decent home office PC.

**■ Your Best Bet.** We liked all of these systems, really. They're all fairly powerful and include nice extras such as a DVD-ROM drive and large hard drives. But we think the best overall system in this review is Gateway's Select 1300CL. It has all the features you'll need, it performed very well in our tests, and it's the least expensive system of the bunch. How can you top that? **GB**

by Michael Sweet

## By The Numbers

	Dell Dimension 8100	Gateway Select 1300CL	HP Pavilion 7875	Micron Millennium Max XP2
<b>Price (including monitor)</b>	\$1,787	\$1,694	\$1,998	\$1,788
<b>Operating System</b>	WinMe	WinMe	WinMe	WinMe
<b>Processor</b>	1.3GHz Intel Pentium 4	1.3GHz AMD Athlon	1.3GHz AMD Athlon	1GHz AMD Athlon
<b>Bus Speed</b>	400MHz	200MHz	200MHz	266MHz
<b>RAM:</b>	128MB RDRAM	128MB DDR-SDRAM	128MB DDR-SDRAM	128MB DDR-SDRAM
<b>Graphics Accelerator</b>	ATI Radeon DDR 32MB DDR-SDRAM	NVIDIA GeForce2 MX 32MB SDRAM	NVIDIA GeForce2 MX 32MB SDRAM	NVIDIA GeForce2 64MB DDR-SDRAM
<b>Video RAM</b>	16X DVD; 12X8X32X	16X DVD; 8X4X32X	16X DVD; 8X4X32X	16X DVD; 12X10X32X
<b>Optical Drive</b>	CD-RW combo drive	CD-RW	CD-RW	CD-RW
<b>Hard Drive</b>	40GB	40GB	80GB	40GB
<b>Monitor</b>	19-inch M991	19-inch EV910	17-inch HP MX 70	Micron 700Mx
<b>Sound</b>	Creative SoundBlaster Live! Value; Harmon	Creative Labs Sound Blaster Live! Value; three-piece Boston	Integrated Crystal audio chip; two Polk speakers	Creative SB Live; Altec Lansing three-piece speakers
<b>Card/Speakers</b>	Kardon three-piece speakers	Acoustic speakers		
<b>Connectivity</b>	56Kbps modem; 10/100 network adapter	56Kbps modem; 10/100 network adapter	56Kbps modem; 10/100 network adapter	56Kbps modem; 10/100 network adapter
<b>Chassis Type</b>	Mid-tower	Mid-tower	Mid-tower	Mid-tower
<b>System Type</b>	Home	Home	Home	Home
<b>SYSmark2000 Overall</b>	143	194	179	178
<b>SYSmark2000 Office Productivity</b>	125	181	163	169
<b>SYSmark2000 Internet Content Creation</b>	170	213	203	190
<b>Video2000 Video Marks</b>	2,057	2,053	2,500	1,830
<b>Video2000 Quality</b>	958	754	1,083	778
<b>Video2000 Performance</b>	1,018	818	818	570
<b>Video2000 Features</b>	530	481	599	481
<b>3DMark2000 3DMarks</b>	4,759	4,791	4,428	6,684
<b>Manufacturer</b>	Dell	Gateway	Hewlett-Packard	Micron
<b>Final Word</b>	Not bad, but low SYSmark2000 scores	This is an excellent PC. It's our first choice among all the systems we reviewed for this roundup.	Good performance, but a little too expensive for what you get.	A solid multimedia PC.

# Spare No Expense

PCs With Price Tags Higher Than \$2,000



**P**C prices are supposed to drop like rocks down a deep well this year, thanks to falling CPU prices and a market-share tug-of-war between rivals Intel and AMD. So if you've been planning on buying a new PC, start warming up your check-writing hand. The time to buy is fast approaching. But just because PC prices are expected to be lower doesn't mean that they'll be low. There are still plenty of budget-busting PCs for you early adopters who always have to have the very latest that the computing world has to offer. If you want the best, you have to pay for the best. We gathered up some of the top PCs available and took them for a spin. The results were delicious. We'll detail each system for you, beginning with Dell's Dimension 8100.

## Dell Dimension 8100

Like the other systems in this review, you can customize the configuration of the Dimension 8100 (\$2,077; 800/999-3355, 512/338-4400; <http://www.dell.com>). We tested a slightly scaled-down version of the Dimension 8100 for our \$1,500 to \$1,999 head-to-head review of PCs elsewhere in this issue, but we had a few enhancements added to the \$2,000 and up version that we tested for this review. The price

difference between the two Dimension 8100s is only about \$300, but we think this version is far better. See if you agree.

The \$2,000 Dimension 8100 has a 1.4GHz Intel Pentium 4 processor (rather than the 1.3GHz processor in other system) and uses the Microsoft Windows Me OS (operating system). This PC has a speedy 400MHz bus speed and has 128MB of high-powered RDRAM (Rambus dynamic RAM). You can increase the RDRAM to a maximum of 1GB.

One of the key differences between the \$2,000 Dimension 8100 and the less expensive model is the video card. This system uses a video card based on NVIDIA's GeForce2 GTS Pro graphics chip, which is one of the top graphics chips you can find. This PC's video card has 32MB of DDR-SDRAM (double-data-rate synchronous dynamic RAM), which is just fine, but all the other systems in this review had 64MB of DDR-SDRAM. Overkill? Perhaps, but then again this is the extra-indulgent class of PCs.

Unlike any of the other PCs we reviewed, the Dell Dimension 8100 uses a Santa Cruz sound card from Turtle Beach, a good choice. We really like the speakers Dell includes with this system also; a five-piece Altec Lansing surround sound system.

The optical drives options for this PC aren't bad. The system we reviewed had a 12X DVD drive installed, but it seems that Dell is going to include 16X DVD drives on the Dimension 8100 models from now on. The 12X8X32X CD-RW (CD-rewritable) drive is one of the faster CD-RW drives you'll find, although most PCs in this price range (and even many PCs in the \$1,500 price range) will have a 12X8X32X CD-RW drive. This Dimension 8100 also has a 40GB hard drive. We like to see a larger hard drive on systems in this price category, but 40GB isn't too shabby. Still, it's the smallest hard drive among all the PCs in this review, and we'll bet the Dimension 8100 is secretly self-conscious about it.

The Dell Dimension 8100 looks sharp and doesn't cost as much as the other PCs in this review, but this system also had a hard time keeping up with the other systems in our benchmark tests. The system's Overall SYSmark2000 score of 156 tied with the HP Pavilion 9800 for the lowest score. The Office Productivity score of 140 and Internet Content Creation score of 180 also lag behind the other systems.

The Dimension 8100 performed a little better in our other tests. Its Video2000 score of 2,596 was second best among systems in this review, and the 3DMark2000 score of 7,550 is actually pretty good, even though it only places third in this roundup.

We're not satisfied with simply judging a PC by its test results, though. We want to see how it works first-hand. So we popped a DVD movie into the DVD drive and went to work. Or play, or whatever. In any case, the Dimension 8100 is a solid machine for playing DVDs. The video looked very nice. And the sound was awesome as well.

We also played a few rounds of Quake III to get a feel for this system's 3-D power. The graphics, as with the DVD video, were very good, but what really impressed us was the sound of the game. This speaker system actually rivals that of the Klipsch ProMedia speakers (see our Falcon Northwest Mach V review), and that is saying a lot.

*There are still plenty of **budget-busting PCs** for you early adopters who always have to have the very latest that the computing world has to offer.*

### Falcon Northwest Mach V

Let's get something straight about the Falcon Northwest Mach V (\$3,595; 888/325-2661, 541/552-1140; <http://www.falcon-nw.com>) right off the bat. This is a hard-core gamer's PC. It's specifically designed to be a gamer's PC. You could certainly use the Mach V to figure out your taxes or to use a word processor or spreadsheet, but that would be like driving a Ferrari 550 Maranello to pick up a few things at the grocery store around the corner. The Falcon Northwest Mach V is a customer customizable system, but we asked the people at Falcon to put together a machine for us, and we're really impressed with the system we received.

The Mach V's 1.3GHz AMD Athlon processor is the slowest among the PCs in this review (the Pavilion 9800 also has an 1.3GHz processor), but the Mach V more than makes up for this tiny performance difference in other ways. For example, the Mach V has 256MB of DDR-SDRAM installed, unlike the 128MB found in most systems. And you can increase the RAM to a hefty 1GB of memory.

The crown jewel of this system has to be the Hercules 3D Prophet III video card, which uses NVIDIA's latest graphics chip, the GeForce3 GPU (let's have a moment of awe-inspired silence). As you'll see in our test results, using this graphics card had a profound effect on the system's test results. Like most high-end graphics cards, this one comes with 64MB of DDR-SDRAM, whether you need it or not.

This system is configured with Hercules audio hardware as well. The Mach V came with the Hercules Game Theater XP audio station, which is a PCI (Peripheral Component Interconnect) sound card and external device combination that is loaded with various features for audio devices and gaming gear, including several USB (Universal Serial Bus) ports. The Mach V also has a Klipsch ProMedia 4.1 speaker system, which in our opinion is the best PC speaker system ever made.

No system is complete without a couple of optical drives, of course, and Falcon Northwest isn't going to cut corners here. The Mach V we reviewed included a 16X DVD drive and a very fast Plextor 16X10X40X CD-RW drive. In fact, that's the fastest CD-RW drive we've seen on a new system so far. The Mach V also has a

*The Mach V did so well in our benchmark tests that there was **only one test** in which it didn't finish in first place.*

60GB hard drive, so you'll be able to load a lot of games onto this PC.

The Mach V did so well in our benchmark tests that there was only one test in which it *didn't* finish in first place. The SYSmark2000 scores were really fantastic. The Mach V's Overall score was a staggering 228, the highest we've seen. The Office Productivity score of 220 is almost 100 points higher than the Pavilion 9800's Office Productivity score. And the Internet Content Creation score of 240 is exceptional.

The only test in which this system faltered a bit was the Video2000 test. The Mach V's total score was 2,438, which still isn't too bad. Of course, the most impressive score the Mach V registered was in the 3Dmark2000 test. This shouldn't be a surprise, given the system's 3-D blasting GeForce3 graphics chip. The Mach V's 3Dmark2000 score was 9,040, the highest we've seen so far.

The Mach V is the best all-around multimedia machine in this review. The DVD video was liquid-smooth and the audio was just about perfect. At some point we stopped consciously "testing" the system and simply kicked back to enjoy the show. It was beautiful.

The Quake III experience was also fantastic. Quake III played better on this system than any of the others we tested, no matter what resolution we played at. This shouldn't be a surprise, given that Falcon Northwest specifically designs its PCs for games. Oh yeah, the audio was also outstanding, thanks to the Klipsch speakers.

Only the most devoted PC gamers need apply for this system. The Mach V's hardware and performance is tops in this review, but so is its price. Unless gasoline prices suddenly drop to a late-1980s level, you may have to mortgage your house to buy this system. The Mach V could very well be worth it.

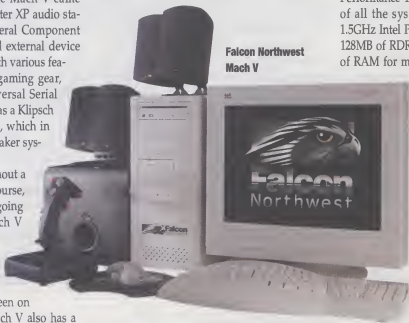
### Gateway Performance 1500XL

The Gateway Performance 1500XL (\$2,689; 800/846-4208, 605/232-2000; <http://www.gateway.com>) tries to give the Falcon Northwest Mach V a run for its money in terms of overall benchmark performance, but can't quite keep up. The price for this system is considerably less than that of the Mach V, however.

The Performance 1500XL uses the WinMe OS, like all the other PCs in this review. The Performance 1500XL has the fastest processor of all the systems in this roundup, with a 1.5GHz Intel Pentium 4 CPU. This system has 128MB of RDRAM, which is a typical amount of RAM for most new PCs. You can increase

the memory to a maximum of 2GB, which is a lot more room for RAM than most PCs offer.

Graphics-wise, the Performance 1500XL goes with a video card powered by the GeForce2 Ultra. Although this video chip isn't nearly as powerful as the latest GeForce3 chip, it's still very robust. The video card has 64MB of DDR-SDRAM. The audio configuration for the Performance 1500XL is solid. You'll find a





Creative Labs Sound Blaster Live! Value sound card under the hood, coupled with a nice five-piece set of Boston Acoustic speakers.

The Performance 1500XL has a typical optical drive configuration for PCs in this price range, with a 16X DVD drive and a 12X8X32X CD-RW drive. The system's 75GB hard drive is by far the largest of any PC in this head-to-head review.

The Gateway Performance 1500XL rang up some impressive numbers when we ran our benchmark tests. The results weren't quite as good as those of the Mach V system, but the Performance 1500XL generally did better than the other two systems.

The SYSmark2000 Overall score for the Performance 1500XL was 163, which is very good. The system scored 144 and 193 points in the Office Productivity and Internet Content Creation sections of the test, respectively. The Video2000 score of 2,202 was a little disappointing. It was the lowest among the systems we tested in this review. But the 3DMark2000 score of 8,892 is superior, especially for a system that doesn't use a GeForce3 graphics chip.

We dropped a DVD into the PC's DVD drive to begin our next round of testing. We noticed a little choppiness in the video when watching the movie. There wasn't a lot of lag

when we were watching the movie, but the video did slow down on occasion.

Our Quake III experience was a little better. We noticed only a little choppiness in the graphics on occasion. And again, the sound was really good. The Boston Acoustic speakers that Gateway includes with this system are first-rate.

For the most part, we like the Gateway Performance 1500XL. The DVD test could have gone a little better, but this system did well in other areas. The price is perhaps a little high, though. The Dell system has nearly the same speed processor and the same amount of RDRAM, yet costs hundreds less.

## By The Numbers

	Dell Dimension 8100	Falcon Northwest Mach V	Gateway Performance 1500XL	HP Pavilion 9800
Price	\$2,077	\$3,595	\$2,689	\$2,414
Operating System	WinMe	WinMe	WinMe	WinMe
Processor	1.4GHz Intel Pentium 4	1.3GHz AMD Athlon	1.5GHz Intel Pentium 4	1.3GHz AMD Athlon
Bus Speed	400MHz	266MHz	100MHz	200MHz
RAM	128MB RDRAM	256MB DDR-SDRAM	128MB RDRAM	256MB DDR-SDRAM
Graphics Accelerator	NVIDIA GeForce2 GTS Pro	Hercules 3D Prophet III (NVIDIA GeForce3)	NVIDIA GeForce2 Ultra	NVIDIA GeForce2 GTS
Video RAM	32MB DDR-SDRAM	64MB DDR-SDRAM	64MB DDR-SDRAM	64MB DDR-SDRAM
Optical Drive	12X DVD; 12X8X32X CD-RW	16X DVD; 16X10X40X CD-RW	16X DVD; 12X8X32X CD-RW	16X DVD; 8X4X32X CD-RW
Hard Drive	40GB	60GB	75GB	60GB
Monitor	19-inch Dell 991	19-inch ViewSonic PF 790	19-inch Gateway VX920	19-inch HP Pavilion V90
Sound Card /Speakers	Turtle Beach Santa Cruz; 5-B1piece Altec Lansing speakers	Hercules Game Theater XP Decoder; Klipsch ProMedia 4.1 THX	Creative Sound Blaster Live! Value; Five-piece Boston Acoustic speakers	Creative Labs Sound Blaster Live! Value; 5-piece Polk Audio speakers
Connectivity	56Kbps modem; integrated 10/100 network adapter	no modem; 10/100 network adapter	56Kbps modem; 10/100 network adapter	56Kbps modem; 10/100 network adapter
Chassis Type	Mid-tower	Mid-tower	Mid-tower	Tower
System Type	Home	Gamer	Home	Home
SYSmark2000 Overall	156	228	163	156
SYSmark2000 Office Productivity	140	220	144	124
SYSmark2000 Internet Content Creation	180	240	193	211
Video2000				
Video Marks	2,596	2,438	2,202	2,618
Video2000 Quality	1,084	771	784	1,143
Video 2000 Performance	912	1,067	937	876
Video2000 Features	600	600	481	599
3DMark 2000				
3DMarks	7,550	9,040	8,892	7,216
Manufacturer	Dell	Falcon	Gateway	Hewlett-Packard
Final Word	Not as powerful as the rest, but the price is right	Nearly as good as it gets	Gives Mach V a run for it's money, but falls short at the finish line	A decent system, but overshadowed by other PCs



# The competition is stiff

in the rarified air of the **\$2,000 PC.**



Gateway Performance 1500XL

## HP Pavilion 9800

Our final system in this head-to-head review of top-tier PCs is the 9800 from Hewlett-Packard. The 9800 is not one of those off-the-rack preconfigured systems. You choose which components you want. We had Hewlett-Packard outfit a system for us.

The system we received has a 1.3GHz AMD Athlon processor and runs on the WinMe OS. The system has a 200MHz bus speed and is loaded with 256MB of DDR-SDRAM, which of course is a lot for a PC in any price range. And you can increase the system's RAM to 2GB.

The Pavilion 9800 (\$2,414; 888/999-4747, 650/857-1501; <http://www.hp.com>) uses a GeForce2 GTS-based graphics card, just like the Dimension 8100 does. However, this PC's video card has 64MB of DDR-SDRAM, whereas the Dimension 8100's video card only had 32MB of DDR-SDRAM. Hewlett-Packard included a nice 19-inch HP Pavilion V90 monitor with the system. You'll listen to your MP3s, DVDs, and other audio through the Pavilion 9800's Creative Labs Sound Blaster Live! sound card and five-piece Polk speaker system.

Optically speaking, the Pavilion 9800 doesn't quite stack up to the other systems in this review. It has a 16X DVD drive, but the system's 8X4X32X CD-RW drive is a little slow for a PC in

this price range in our opinion. The system does include a sizeable 60GB hard drive.

In and of itself, the Pavilion 9800 is a solid machine that yields good test results in our benchmark tests.

But this PC tended to lag behind the other systems we reviewed in this roundup. The competition is stiff in the rarified air of the \$2,000 PC. Of course, the Pavilion 9800 can still look down with disdain upon those wimpy \$1,500 machines.

The Pavilion 9800 tallied a SYSmark2000 Overall score of 156, which is pretty good, really. The exceptional Overall scores posted by the Mach V and the Performance 1500 systems make this score look worse than it really is. The Pavilion 9800's Office Productivity score of only 124 is a bit low for a PC with this hardware configuration, but it had an excellent Internet Content Creation score of 211, second only to the Mach V.

The Pavilion 9800's Video2000 score of 2,618 edged out the Dimension 8100's score of 2,596. The 3DMark2000 score of 7,216 is low compared to the other systems we tested in this review, but in general anything over 7,000 in the 3DMark2000 test is not bad.

We moved onto the next phase of testing and watched a DVD movie on the system. When you test PCs at this level of power and quality, it's hard to find genuine problems with them, and that's the case with the Pavilion 9800. The video flickered just a little bit on occasion, but hardly enough to notice. The sound was pretty good also. Generally, we're not too fond of the tiny Polk satellite speakers that are included with some lower-end PCs. But this five-piece system from Polk is actually really good.

We played a few rounds of Quake III next, and that test went well also. Generally, the graphics were very smooth. Quake III didn't run quite as well on this system as it did on the Mach V or Dimension 8100, but it did run about as well as on the Gateway system.

We think the Pavilion 9800 is a good system—we really do. BUT, the Dimension 8100 is less expensive and seems to perform a little better. And the Falcon Northwest Mach V, though considerably more expensive, blows the doors off the Pavilion 9800. It's not that the Pavilion 9800 isn't a good PC. It's just that the other systems seem to have some kind of advantage over this system, either in price or performance, and the Pavilion 9800 finds itself caught in the middle. But if you have an affinity for Hewlett-Packard PCs, then you will certainly like the Pavilion 9800, and we won't blame you a bit.

HP Pavilion 9800



■ **The Best Of The Best.** It occurs to us that the purpose of testing PCs in this price range is to find the very best PC there is, regardless of cost. That being the case, the clear winner in this contest is the Falcon Northwest Mach V. Of course, it won't be long before we see many systems with 1.7GHz Pentium 4 processors and GeForce3 graphics cards, so the Mach V better savor this honor while it can. [S]

by Michael Sweet

## Toshiba PDR-M60

The PDR-M60 from Toshiba isn't without a few limitations and problems, including a skimpy amount of bundled memory, a lack of manual control options, and the omission of an uncompressed shooting mode. But don't let these slight blemishes distract you from strongly considering this digital camera, especially if you're a newer user. This digital camera still has a lot to offer.

Toshiba makes using the PDR-M60 exceptionally easy. That's primarily due to the fact that its manual controls are essentially limited to selecting the camera speed (ISO 100 to ISO 400), adjusting exposure and white balance settings (auto, outdoor, incandescent, fluorescent light 1, and fluorescent 2), and selecting a quality setting and flash mode. Combined, this doesn't leave much room for creativity, but it does make using the camera a simple matter of inserting four AA alkaline batteries and the bundled 4MB SmartMedia memory card (storing just three to 55 shots).

The camera's resolutions are limited to 1,792 x 1,200 pixels and 896 x 600 pixels.



Images we captured were slightly dark and not as sharp as we expected. However, the images did feature accurate colors and good overall clarity and are suitable for good 5- x 7-inch prints and Web uses.

The camera compensates for any memory and image shortcomings with its shot-to-shot speed, which is about a second and is very good for a model in this price range. The camera's f2.8-to-f3.2 lens (equivalent to a 38mm-to-86mm lens on a 35mm camera) has 2.3X optical zoom and can focus on objects as close as 2 inches in macro mode. There's also 2X digital zoom and a USB (Universal Serial Bus) connection to transfer shots.

Managing the camera is extremely easy thanks to a four-way jog button and mode dial.

In addition, the camera is well organized and designed. However, the 1.8-inch LCD (liquid-crystal display) is a bit too far to the left, as are the optical viewfinder and lens, so take care not to cover the lens with your fingers. More positive is the built-in lens cover, oversized right-hand grip, slanted mode dial, and good position of the zoom lever.

At about \$375 (Estimated Street Price), the PDR-M60 is easy on the checkbook, and it won't take long for users to learn how to operate it. Its manual options are few, but the camera's speed, ease of use, and image quality are well worth checking out. **[E]**

by Blaine Flamig

### PDR-M60

\$375

Toshiba

(800) 550-8674

(949) 583-3000

<http://www.toshiba.com>

## NEC MultiSync LCD1700M

Are you looking for a good, all-purpose LCD (liquid-crystal display) at a decent price for your business or home office? Then you'll want to check out the NEC MultiSync LCD1700M. In addition to 1,280 x 1,024 resolution, a 75Hz refresh rate, and a .26mm dot pitch, the 15.6-inch high x 16.6-inch wide x 3.4-inch deep (without the stand), 16-pound monitor comes with built-in speakers and is attached to a swivel and hinges for easy viewing-angle adjustment.

There are only three OSD (on-screen display) buttons and a knob below the monitor's frame, so you can quickly figure out how to adjust your display's settings. There's also an Auto button to automatically adjust display settings, which are very basic and include contrast, brightness, screen position, color temperature, recall, zoom, OSD menu position, and language settings. To navigate the menu, simply turn the knob below the buttons to scroll through the OSD options and press ENTER to make your selection.

To install the LCD1700M, just plug the standard 15-pin SVGA (Super Video Graphics Array) D-sub connector into your computer and

boot your PC. NEC didn't send a manual with the monitor we tested, but if you run into problems you can view a reference guide on the monitor's online product page.

Overall, we were impressed with the imaging capabilities of the NEC display. Desktop and scaled text appeared sharp and clean, and we could see almost no blooming among varying intensities of lines. Colors looked bright, vivid, and alive, and the LCD did a superb job of rendering a wide range of grayscales and color shades. Details were clear and focused, and lines appeared straight and true.

Video bandwidth results could have been better. We noticed some ghosting in images with stark changes of intensity, as well as scan lines in several other test screens. In addition, color registration, though not the worst we've seen, should have been more aligned vertically.



However, the LCD1700M's excellent photograph rendering capabilities easily overshadowed any deficiencies we may have noticed. Pictures on the screen looked simply wonderful. Rich, bright colors, impressive details, and excellent lighting and shading brought the images alive and produced some of the best-rendered photographs we've ever seen on an LCD.

Although not a monitor suited for high-end graphics creation and editing applications, the NEC MultiSync LCD1700M is a top-notch display that can handle a wide variety of user demands, whether general, business, or gaming oriented. The display's price is also reasonable. **[E]**

by Lori Robison

### MultiSync LCD1700M

\$1,251

NEC Technologies

(800) 632-4636

(630) 467-5000

<http://www.nectech.com>

# Falcon Northwest Talon 3.0

**F**alcon Northwest may not be the first name that rolls off your lips when you think of PC manufacturers, but if you are a gamer or if you want a good multimedia PC, you should know about this company.

Falcon Northwest specializes in making PCs with gamers in mind, which means these systems are loaded with a lot of high-end hardware. You can expect to find some of the latest and greatest multimedia hardware inside a Falcon Northwest PC. Falcon Northwest's high-end systems cost thousands of dollars, or at least a few gallons of gasoline, but you can also buy a more tame Falcon system, the Talon 3.0, for less than \$1,500. After checking out this system, we think that's an excellent deal.

The Talon 3.0 uses a 1GHz AMD Athlon processor and runs the Windows Me operating system. The system we tested came with 128MB of DDR SDRAM (double-data-rate synchronous dynamic RAM), which you can increase to a staggering 2GB of RAM.

The Talon 3.0 doesn't use the very latest graphics chip, but it does use an Asus AGP V7700 Pro graphics card, which is a real screamer that should satisfy most gamers, especially those on a budget. The AGP V7700 Pro has 64MB of DDR SDRAM, so it's not like you're cutting corners with this card. The Talon 3.0 also has an excellent audio setup. It uses Creative Lab's Sound Blaster Live! Value card and a three-piece Klipsch ProMedia v2.1 speaker system, which is the second-best speaker system ever made for the PC, in our opinion (the first being Klipsch's five-piece ProMedia v4.1 speaker system). This PC will deliver truly excellent sound, whether it comes from a game, an audio CD, or a DVD.

You can't watch a DVD movie on your computer

without a DVD drive, of course, and the Talon 3.0 does include a 10X DVD drive. However, the test system we received didn't have a CD-RW (CD-rewritable) drive, which is something we'd like to see on just about every new system these days. But when you look at all the other great hardware this system offers, it's easy to understand that Falcon Northwest would have to cut corners somewhere to keep the price of this system under \$1,500. This may also be why the system has a rather small 15GB hard drive. Today's PC games are some of the largest programs you can install on your PC, so they eat up hard drive space quickly.

The Talon 3.0 does have plenty of room to grow, so upgrading the system (presumably with a CD-RW drive and another hard drive) won't be a problem. The system has five PCI slots, two of which are available. You'll also find three 3.5-inch and three 5.25-inch drive bays. One of the 3.5-inch drive bays is open, as are two of the 5.25-inch bays. The case is pretty roomy, which will make installing new hardware even easier.

**Testing.** The Talon 3.0 proved to be a rock-solid PC in our testing, with benchmark scores that we'd expect to see on pricier systems with faster

processors. The Talon 3.0's SYSmark-2000 scores were good for a PC in this price class, with an Overall score of 174, an Office Productivity score of 167, and an Internet Content Creation score of 183. So the Talon 3.0 would also make a decent office PC, although that's not exactly what it's designed for.

The Talon 3.0 really showed some muscle in our Video2000 and 3DMark2000 tests. The system's Video2000 overall score of 2,349 is higher than average, and the 3DMark-2000 score of 7,486 is simply fantastic. We doubt you can find another PC for less than \$1,500 that can post a similar 3DMark2000 score.

We rounded out our tests by watching a DVD movie, playing Quake III, and listening to a few audio CDs. The DVD experience was fantastic. The video was sharp and ran very smoothly, and the audio was as pure as the driven snow.

Our game-playing experience was nearly as good. The game graphics were smooth and vivid, for the most part. About the only problem we ran into was when the game's cursor (controlled by the optical mouse) got hung up for a second or two at one point. But this seemed more like an anomaly rather than something to really worry about. The audio CDs, as we expected, sounded excellent, just like the movie and the game. The Klipsch speakers are simply awesome.

If you're into PC games and want a high-powered machine without going deep into debt, the Falcon Northwest Talon 3.0 is your salvation. It's a great system. **ES**

by Michael Sweet

## Features

**Processor:** 1GHz AMD Athlon  
**RAM:** 128MB DDR SDRAM  
**Hard Drive:** 15GB  
**Optical Drive:** 10X DVD  
**Connectivity:** 56Kbps modem  
**Video Card:** Asus AGP V7700 Pro  
**Monitor:** 17-inch Optiquest Q71  
**Chassis:** Mid-tower  
**System Use:** Home/Gamer  
**Final Word:** The Talon 3.0 is a great bargain. It has lots of power, yet it costs less than \$1,500.



## Talon 3.0

**\$1,495**  
**Falcon Northwest**  
**(888) 325-2661**  
**(541) 552-1140**  
<http://www.falcon-nw.com>

## Canon S600

Canon unveiled a colossal marketing campaign to hype their newest printer, the S600. Because we have been disappointed by its inks in the past, we were intrigued as to whether this fresh offering would be a powerful addition to the Canon arsenal or canon fodder.

We'll start by saying the S600 is one of the finest all-around inkjets we've tested. The S600 doesn't embarrass the competition, but it does consistently outperform other midpriced inkjets.

The S600 weighs 11 pounds and measures 6.97 inches high x 16.93 inches wide x 11.57 inches deep. The paper tray holds 100 sheets, and there are two connectivity options in either parallel or USB (Universal Serial Bus).

After a trouble-free setup and easy print head alignment, we printed a page of fonts. Fonts aren't as richly dark as other top performers we've tested, such as the Xerox DocuPrint M760, but they are equally sharp.

The S600 then squared off in its fastest mode against a 10-page text document. The first page

drop-ped in 0:17, and the last page finished in 1:27, a 6.9ppm (pages per minute) rating. The S600 depicted characters consistently well and with minimal fuzziness. This is one of the few printers we'd trust our important documents to in draft mode.

The S600's aptitude in dealing with a combination of text and graphics was equally good. Text was just a tad fuzzy, but graphics were gorgeous, with precise colors and no banding whatsoever. The quality cost some time, however. The first of six pages was completed in 3:47, and the sixth page in 10:20. PowerPoint times were much better. The printer needed only 1:16 to complete three slides, and the first page was out in 0:24. Black markings should have been more smoothly darkened, but the color bar graphs were as good as we've seen.

Our two high-resolution photos printed on both regular and photo-quality paper. The S600 prints speedily on normal stock; our file took only about seven minutes to finish. We spotted some graininess on a woman's portrait, most obvious in shadowy areas where black met

peach skin tones. A floral arrangement was sharp in detail, and we could see no banding.

Photo-paper results were somewhat mixed. All aspects of the photos were sharply portrayed, but the colors in the woman's face weren't as rich as they should have been. Our flowers, though, turned out stunningly. Colors were vibrant, and every hue from yellow to purple was painted accurately. Print times were on the slow side, but still acceptable. We timed the photo-paper prints at about 15 minutes.

The S600 is a huge step forward for Canon's inkjet line and is sure to prove the company's mettle to competitors. Despite some lethargic Word print times, you won't find better quality in an inkjet at this price. **[S]**

by Nathan Chandler

### S600

\$199

Canon

(800) 385-2155

(714) 438-3000

<http://www.usa.canon.com>

## CTX PR960F

Just because a monitor doesn't break records for versatility doesn't mean it won't work for you. Not every user demands the wide range of imaging capabilities found in some higher-end monitors; some people prefer a display for games, Web surfing, picture editing, and other common tasks.

For these users, there's the 19-inch CTX PR960F. In addition to 1,600 x 1,200 resolution capabilities, this aperture grille display has a low 24mm dot pitch and a whopping 120Hz maximum refresh rate at our 1,024 x 768 testing resolution. Unlike some displays that produce flicker lines at the higher image settings, the PR960F screen looks good, displaying a steady image at all resolution and refresh settings.

The unit's five-button OSD (on-screen display) is easy to learn and use, though clearly labeled buttons would make accessing the menu and making setting adjustments even easier. Still, the PR960F has most of the amenities you would want when adjusting your screen, including contrast, brightness, screen position and size, rotate, pincushion, trapezoid, parallelogram,

color temperature, de-gauss, recall, moiré, and language settings.

Installing the CTX display is simple. The device comes with the traditional 15-pin SVGA (Super Video Graphics Array) D-sub connector you can use to plug the monitor in. There's also a BNC (Bayonet Nut Connector) connector option for high-end graphics professionals who want to boost the monitor's imaging capability. The display even includes USB (Universal Serial Bus) downstream ports to easily hook up peripherals.

Text, though slightly fuzzy, looked pretty good in our test documents and was still readable. We did see a lot of blooming among varying intensities of screen objects, and video bandwidth, although better than many CRTs we've seen, still could have been a bit better. However, moiré patterns were very slight; we saw only minimal jumping in the screen regulation test. Linearity and color registration were nearly perfect, and photograph-rendering capabilities were impressive. Colors were bright and



vivid, and photographs appeared with nice, clear details and good shading and lighting.

At \$450, the CTX PR960F is a good, reasonably priced choice for users looking for excellent color rendering, solid graphics, and gaming display performance.

Users who do a lot of word processing may be bothered by the slightly fuzzy text, though, and high-end users with intense graphic display demands may want to look elsewhere. Even so, the CTX display performs well enough for the demands of the majority of home users. **[S]**

by Lori Robison

### PR960F

\$450

CTX International

(800) 266-1491

(626) 709-1000

<http://www.ctbintl.com>



# eMachines eMonster 800

The eMonster 800 from eMachines is a value-priced personal computer that actually does have some value. We liked the system's overall performance and features, especially when you look at its price tag. The eMonster 800 easily outperforms almost all of the sub-\$1,000 PCs we've tested.

The eMonster has an 800MHz Intel Pentium III processor and uses Microsoft's Windows Me operating system. This PC has 64MB of SDRAM (synchronous dynamic RAM), which you can expand to a maximum of 256MB. You can upgrade most PCs to 512MB of memory, but most users stick with 128MB of memory or less, so this probably isn't a big deal. The eMonster 800 has two slots available for RAM, one of which is open.

The folks at eMachines saw fit to use a 2X AGP (Accelerated Graphics Port) Intel 810 integrated graphics chip on this system. A no-frills graphics chip such as this will typically slow down a PC, but the eMonster 800 seemed to run a little better with the 810 than most other systems that use it. This system doesn't include a monitor, but eMachines sent us a 15-inch eView 15p to use with the eMonster 800. It's not bad, but we prefer a 17-inch monitor.

One of the features we like best about this system is that it has both a 48X CD-ROM drive and an 8X4X32X CD-RW (CD-rewritable) drive. Not very many systems in this price class come with two optical drives. The system also has a basic floppy diskette drive. The eMonster 800 has a 30GB hard drive, which is a good-sized hard

drive for a system in this price category. The eMonster 800 also has a 56Kbps (kilobits per second) modem.

This system uses an integrated audio chip and comes with a small pair of satellite speakers. If you're an audiophile, you'll be underwhelmed by this audio combination, but you have to make a



#### Features

**Processor:** 800MHz Intel Pentium III  
**RAM:** 64MB SDRAM  
**Hard Drive:** 30.7GB  
**Optical Drive:** 48X CD-ROM; 8X4X32X CD-RW  
**Connectivity:** 56Kbps modem  
**Video Card:** Integrated audio; two satellite speakers  
**Monitor:** Sold separately  
**Chassis:** Mid-tower  
**System Use:** Home  
**Final Word:** Very good for a sub-\$1,000 PC.

few sacrifices here and there if you want a sub-\$1,000 PC. eMachines includes some nice software as part of the system package. It includes MS Works 2000, Money 2000, Easy CD Creator 4, and Trellix Web.

The eMonster 800 doesn't offer a whole lot of room to play around under the system's hood. The case itself isn't that small, but it's packed to the gills. Of the three PCI (Peripheral Component Interconnect) slots, only one is available. And there are no open drive bays, either. Both of the 3.5-inch bays and both of the 5.25-inch bays are occupied. As for ports, the eMonster 800 has one serial and one parallel port. It also has two USB (Universal Serial Bus) ports, one in the front of the system and one in the back.


**Benchmarks.** The eMonster 800 didn't exactly scorch the wheels off

our benchmark tests, but it did better than most other systems we've seen in this price category. The SYSmark-2000 Overall score was 103, which is surprisingly good. The eMonster 800 had an Office Productivity score of 101 and an Internet Content Creation score of 105. These scores are better than average for a system with an 800MHz CPU and an Intel integrated graphics chip.

The eMonster 800 also managed to do well in our Video2000 test, in which the system posted an overall score of 1,053. Most systems in the sub-\$1,000 category don't top 1,000 points in this test. The 3DMark2000 score was just slightly better than average at 837. This suggests that the eMonster 800 probably won't be an especially good gaming PC.

We popped in Quake III to determine exactly how well this system could handle games. It ran Quake III fairly well at low resolutions, but when we tried to kick the resolution up to 1,024 x 768 or higher, the gameplay wasn't very smooth. It was really choppy and jumpy, and the sound wasn't especially good either.

We found this to be true of audio applications in general. We listened to a couple of audio CDs on the eMonster 800. The speakers aren't great by any means, but they're about what you'd expect from a sub-\$1,000 PC. Most users won't be buying this system for its multimedia prowess, though, so this probably isn't a major concern.

If you're looking for an affordable second PC for your home or if you are simply looking for a good bargain, the eMonster 800 is hard to beat. It's way better than most of the sub-\$1,000 PCs we've seen lately. 

by Michael Sweet

#### eMonster 800

**\$849 (\$799 after rebate)**

**eMachines**

**(877) 566-3463**

**(714) 481-2828**

<http://www.e4me.com>



## Panasonic PV-SD5000 SuperDisk PalmCam

Three significant characteristics of the PV-SD5000 SuperDisk PalmCam from Panasonic jump out at you. The first is its size. The second is the camera's unique, mammoth memory. The third, the price, is unfortunately also considerable.

At more than 1.5 pounds, you'll want to connect the camera's neck strap and use it. The camera measures about 6 inches high and spans more than 4 inches wide, making it anything but inconspicuous. The size does enable Panasonic to include a huge 2.5-inch LCD (liquid-crystal display) and built-in speaker on the back. The spacious design includes a mode dial and four-way jog button to navigate the menus easily.

The PV-SD5000's size is a direct result of the camera's ability to use either 120MB SuperDisk or 1.44MB floppy diskettes to store shots. Not only is this memory solution ultra-convenient, it enables the camera to store up to 1,500 shots when you insert a SuperDisk (only about \$10 each).

In turn, the memory is the primary reason for the camera's \$1,000-plus price tag. Fortunately, Panasonic shines in a great deal for those dollars. To start, the shooting resolution hits an impressive 2,048 x 1,536 pixels. You can also shoot at 1,024 x 768 pixels, take up to 120 consecutive shots at 320 x 240 pixels every 0.1 seconds, and record 12-second video clips with audio. Finally, a Time Lapse mode lets you take shots from once a minute to once every 24 hours.

In addition to the standard assortment of features most cameras typically include, Panasonic packs the PV-SD5000 with 3X optical and 3X digital zoom, a burst mode to take five straight shots in 0.9-second intervals, and a RapidFire mode to shoot 12 images before they write to memory in JPEG (Joint Photographic Experts Group) or TIFF (Tagged Image File Format) files.



Oddly, the camera does not have an optical viewfinder, and deleting shots is more difficult than need be. However, the feel of the camera is wonderful, and a lithium-ion battery provides an excellent power source. Shots we took definitely

rate above average, with details especially sharp and colors vivid and strong.

The PV-SD5000's price automatically makes it appealing to a select few consumers, but the camera's storage, features, and overall package should appeal to anyone. The combination of superb storage and fine images and options make the camera a solid choice, provided you can find the financial resources to obtain it. **BS**

by Blaine Flamig

### PV-SD5000 SuperDisk PalmCam

\$1,099.95

Panasonic

(800) 211-7262

<http://www.panasonic.com>

## HP e-printer e20

It looks more like a VCR than a printer, but print it does. "It" is the e-printer e20 from HP, an inkjet product designed for use with interactive TV such as WebTV. Its unusually compact case will camouflage it amongst the other gadgets in your entertainment center.

This is no ordinary inkjet printer. It's completely stackable; paper feeds through a 90-sheet capacity front tray, does a u-turn inside the printer, and slides out the front again. You can reach ink cartridges through a front panel as well, which means you won't have to excavate the e20 from the bottom of a component stack to fiddle with it.

As we mentioned, the e20 is compatible with interactive TV services such as WebTV, AT&T Interactive Digital Cable, and AOL TV. You won't need to hock your CDs to make room for the e20 on your entertainment center; the unit measures 4 inches high x 16.4 inches wide x 14.25 inches deep and weighs 13.6 pounds.

Because we didn't have an interactive TV device, we connected the e20 to our regular test PC with a parallel cable. (HP stresses that the



e20 is not made for PC use.) You can also use a USB (Universal Serial Bus) cable to connect the e20, which HP provides.

Because the e20 is an atypical inkjet printer, our usual test outcomes don't necessarily reflect its usefulness. However, we have included our PC-based results to give you an idea of the performance you can expect. The times are much slower as compared to most inkjets; HP rates the e20 at 2.1ppm (pages per minute) in black-and-white and 0.8ppm color.

We first printed a one-page font test. Output was adequate, but there was some notable roughness on the sides of characters, and ink wasn't evenly dispensed. This results in blotchy-looking letters. The 10-page text file was clearly printed at a low resolution. Words had jagged letters, and bolded text was rather light. It's acceptable production, but rather slow; this file took 7:37 (1.3ppm).

Our Word file, which is a mishmash of graphics and text, required almost 12 minutes

to print. Three PowerPoint slides needed more than a minute each to complete. The lower resolution used to print color boosted the e20's speed. It needed only about five minutes to print both of our photos. When compared to the images you could get from a regular inkjet at this price, the quality is poor. Banding is minimal, but pictures come out with a lot of graininess due to the low resolution. However, colors were very accurate, better than some more expensive inkjets we've seen.

This printer's purpose is to fill a niche market catering to Internet-TV enthusiasts, and its price is appropriate for the level of technology provided. If you use your TV to surf the Web and need a basic printer, the e20 should be right at home in your living room. **BS**

by Nathan Chandler

### e-printer e20

\$149

Hewlett-Packard

(800) 613-2222

(650) 857-1501

<http://www.hp.com>

# Actiontec Internet Phone Wizard

ITSPs (Internet telephony service providers) are companies that let you make free or cheap PC-to-phone calls over the Internet. Although ITSPs sometimes change prices without notice, you can still place free phone calls anywhere in the United States using your computer, headphones, and a microphone.

Actiontec's Internet Phone Wizard PCI (Peripheral Component Interconnect) card lets you skip the microphone and headphones and use your telephone instead for a phone-to-PC-to-phone experience. It even has "call waiting" in case someone calls you the regular (analog) way while you're on an Internet phone call. You can then press the phone's pound key (#) twice to switch back and forth between the two calls.

We installed Actiontec's PCI card and connected it to our phone and 33.6Kbps (kilobits per second) modem. Most users still have 56Kbps or slower dial-up modems, so we wanted to see how this product behaved on a slow connection.

Using version 3 of the Wizard's drivers, we successfully set everything up. We followed the Wizard's instructions closely, connecting to the Internet and picking up our phone. We later found that skipping a step at this point (pressing # twice) became necessary. After we helped Microsoft's NetMeeting to install itself and after signing up for service with an ITSP called Dialpad (<http://www.dialpad.com>), we placed a few calls. Actiontec says you should be able to dial from your phone, but we had to type the numbers on-screen for some reason.

Our calls worked, but even the local ones had echoes and delays of a few seconds between one person speaking and the other hearing. Of course, a faster modem or broadband connection would have helped. So would have calling during times of light Internet traffic.

As with anything "free," there's a list of "yeah, buts." To use the Internet Phone Wizard,



you still need Internet access through your ISP (Internet service provider), which costs \$10 to \$60 per month. You also have to sign up with different ITSPs to get the best prices on calls to various countries. You'll find a list of participating ITSPs and their services at <http://www.actiontec.com/products/voip/itsp.html>.

We're not sure it's worth \$80 to use our phone for Internet calls instead of a headset, but some users might. Actiontec also lists an external USB (Universal Serial Bus) Internet Phone Wizard for \$100, which does the same thing without taking up one of your PCI slots. [E]

by Marty Sems

## Internet Phone Wizard

\$80

Actiontec

(800) 797-7001

(408) 752-7700

<http://www.actiontec.com>

# Lexmark J110

Expensive inkjet printers such as the Lexmark J110 are likely too pricey for home use, but they're perfect for small workgroups. We pushed our review unit to its limits to determine how well it would suit your small office.

To connect the printer, you can use a parallel or USB (Universal Serial Bus) cable; network connectivity works via PC Serial, Token-Ring, or 10/100Base-TX Ethernet. The J110 is 11.7 inches high x 20.3 inches wide x 20.1 inches deep. It weighs 35 pounds. A 250-sheet paper tray is included, and a 250-sheet tray is optional.

This isn't a regular desktop printer, as indicated by the \$899 price. It's designed for a monthly duty cycle of 10,000 pages, and it can handle up to 140-pound stock. The J110 has 8MB of RAM, and it sports a 100MHz processor. The standard printer language is PCL 3 emulation.

We started our tests by printing a page of fonts. Characters were sharp and dark but slightly fuzzier than other printers we've seen in this price range. We then printed a 10-page text file in draft mode, which on the J110 has a



resolution of 300dpi (dots per inch). The J110 completed the file in 1:17, or 7.8ppm (pages per minute). Text quality was good for this mode.

The J110's adequately handled a six-page blend of graphics and text. We noticed significant banding in graphics, and text had an aura of fuzziness. At 2.7ppm, print speed wasn't impressive. PowerPoint slide performance, however, was much more remarkable. Black was evenly dispersed in the proper areas, and colors were accurate with only a little graininess. Speed was exemplary, producing a rating of 7.8ppm. The first-page-out time was only 0:10, and the third slide completed in just 0:26.

The J110 can print photos at a resolution of 2,400 x 1,200, but only when using specially designed photo paper; it took nearly 20 minutes

for our high-resolution photo to print on this paper. When we used regular paper, the same graphic took only 4:40. However, as the J110 picks up speed, quality suffers. The plain-paper results were visibly banded upon close scrutiny. Lighter colors looked a tad faded.

We waited longer for the photo-paper production, but we liked the results. Banding disappeared completely, and our test PhotoShop images had beautiful color.

We don't see many inkjets at this price, but the J110 tops the others we've reviewed. This printer could slow down a group that prints a lot of photos. Still, its plain-paper graphics are pleasing, and the J110's speeds will accommodate the text needs of most small offices. [E]

by Nathan Chandler

## J110

\$899

Lexmark

(800) 385-2155

(714) 438-3000

<http://www.lexmark.com>

## Samsung SM-308 CD-RW/DVD-ROM Drive

**H**ard drives, diskette drives, CD-RW (CD-rewritable) drives, DVD drives, Zip drives, flash memory card drives. . . This isn't one of Dr. Seuss's signature litanies, and it's too painfully true to be amusing: There isn't enough room in most computers for all the storage options you may want. If your PC has only one free 5.25-inch drive bay, and you've ruled out external drives for whatever reason, a combination CD-RW/DVD-ROM drive such as Samsung's SM-308 should pique your interest.

DVDs use the same size of optical disc as CDs. That said, it's not much of a stretch to imagine a single drive that can handle both. This includes burning CDs, playing DVD movies, and running all of your CD-ROM software.

Combo drives have been around for a while, but until recently, they've been priced out of reach. Not so with the attractive \$249 SM-308. It's rated at 8X/4X/32X/8X (CD-R write/CD-RW rewrite/CD read/DVD read), where a CD "X" equals 150KBps (kilobytes per second)

and a DVD "X" equals 1.35MBps (megabytes per second).

We installed this ATAPI (Advanced Technology Attachment Packet Interface) drive as a master device on the secondary EIDE (Enhanced Integrated Drive Electronics) channel of our IBM test system. This system has a 450MHz Pentium III processor, 128MB of RAM, and Win98SE.

Under the CD Tach 98 2.00 benchmarking program, the SM-308 scored a 3,259KBps average read rate for a weighted average drive rating of 20.2X. In most test runs, its read rates dropped off sharply near the outer edges of the CD. The SM-308 showed an outstanding 80ms (millisecond) random-access time but also a relatively slow 241ms full-stroke access time. It took 16:32 (minutes:seconds) to write 42/MB to a CD-RW (430KBps) and 7:24 to a CD-R (962KBps).

As a DVD player, this combo drive read on average 5,810KBps (4.3X weighted average), with 120ms random-access and 218ms

full-stroke access times. We used DVD Tach 98 2.52 to arrive at these scores. The anomaly in this case was that the read rates peaked at roughly 8,500KBps near the middle of the disc (around the 2.3GB point), dropping back down to about 4,800KBps to 5,400KBps thereafter.

The SM-308 comes with Roxio's (formerly Adaptec) Easy CD Creator and DirectCD software, as well as CyberLink's PowerDVD. It's compatible with most CD and DVD formats and the Win95/98/Me/NT4/2000 operating systems. Compared to standalone CD and DVD drives, it's an adequate performer, but a great value. [E]

by Marty Sems

### SM-308 CD-RW/DVD-ROM Drive

\$249

Samsung

(800)726-7864

(201)229-4000

<http://www.samsungelectronics.com>

## ThrustMaster FireStorm Dual Power Gamepad

**S**ome PC games work best when played with just a keyboard and mouse, while others lend themselves to specialty controllers such as joysticks and steering wheels. In the last few years, the popularity of TV gaming consoles and the proven versatility of their analog and digital control pads has prompted companies such as ThrustMaster to adapt such controllers for PC games. Sports games, console-style platform games, and various other genres seem to work well with game pads, and ThrustMaster's FireStorm Dual Power Gamepad is a good example of console-like control for the PC.

ThrustMaster offers three variations of its FireStorm Gamepads, including a basic digital model, an analog version with dual analog thumb sticks, and the Dual Power with Immersion's TouchSense force feedback technology. Force feedback is becoming a popular technology in all kinds of gaming controllers because it provides even greater immersion to the gaming experience. For example, if you're

playing a football game (such as EA Sports' Madden NFL 2001) and a 250-pound linebacker levels your running back, a force feedback controller jolts, shuddering in your hand to simulate the sensation of contact.

The Dual Power Gamepad has two built-in force feedback motors that provide varying degrees of feedback based on the intensity of the action on your PC monitor. It features dual analog control sticks that give you 360 degrees of variable-speed control for all types of games, as well as a digital direction pad and 13 programmable buttons. The analog control sticks are just tight and springy enough to be responsive without being stiff and make moving around in 3-D environments easy. The four buttons on the right side of the front of the pad are within easy reach of the right thumb, making them ideal for jumping, shooting, and toggling menu



functions. The three sets of triggers underneath the pad are handy for strafing (lateral movement) and a variety of other functions, as well.

The USB (Universal Serial Bus) FireStorm is easy to install: Just plug it into an available USB port and insert the included driver software as prompted by Windows. Its force feedback motors draw power directly from your PC, so no batteries are necessary, and the included

ThrustMapper 3 programming software makes configuring its buttons a breeze. The rubber grip insets are comfortable for marathon gaming sessions, and its \$39.99 price tag is comfortable where it counts most—the wallet. [E]

by Chris Trumble

### FireStorm Dual Power Gamepad

\$39.99

ThrustMaster (a division of Guillemot)

(877)484-5536

(415)547-4050

<http://www.thrustmaster.com>

# Toshiba Satellite

## 1755

Toshiba's Satellite family of notebook PCs includes a wide variety of value-priced units with varying processor speeds and features. The 1755 sells for a mere \$1,299 but includes a 13.3-inch TFT (thin film transistor) display and a DVD-ROM drive. Its mobile Intel Celeron processor provides good basic computing power, and of course you get standard features such as an internal modem, a 10GB hard drive, and an integrated floppy diskette drive.

**Specifications.** The 700MHz Celeron CPU that drives the 1755 gets help from 64MB of PC100 SDRAM (synchronous dynamic RAM), which you can expand to 192MB should the need arise. Its standard 10GB hard drive is modest by today's standards but should prove more than adequate for most users unless they download lots of multimedia files or save high-quality photos to it. The unit is 1.5 inches high when closed x 12.7 inches wide x 10.9 inches deep and weighs 6.9 pounds. Its size and weight put it somewhere between the desktop replacement units (its display is a bit too small for that category) and thin and light notebooks that usually weigh less than 6 pounds, but its size gives it the advantage of three-spindle access. In other words, you can simultaneously use the hard drive, the 6X DVD-ROM drive on its right side, and the 1.44MB diskette drive on its front edge.

Other standard features include a 9.6-volt NiMH (nickel-metal hydride) battery, a 13.3-inch active-matrix display, an ATI Technologies RAGE AGP (Accelerated Graphics Port) Mobility video control chipset with 4MB of video memory, and a 56Kbps (kilobits per second) modem. We generally prefer Li-Ion (lithium-ion) batteries to NiMH models, and more video memory is almost always better, but both of these features are reasonable tradeoffs for a notebook this affordable.



### Features

**Processor:** 700MHz Celeron  
**RAM:** 64/192MB  
**Display:** 13.3-inch TFT  
**Dimensions (inches):** 1.5 x 12.7 x 10.9  
**Weight (pounds):** 6.9  
**Hard Drive:** 10GB  
**Optical Drive:** 6X DVD-ROM  
**Connectivity:** 56Kbps (Kilobits per second) modem  
**Final Word:** This is a great \$1,299 notebook; its 700MHz Celeron tested out a little slower than we'd have liked, but its multimedia scores were good, and it has great input devices.

Toshiba preinstalled Windows Me with our review unit, as well as Quicken 2001, McAfee VirusScan, and a few other utility programs.


**Design.** The 1755 has a sharp-looking gray and silver case that is pretty tough for the most part, although we'd like to see a bit more stiffness throughout the lid panel, which seems a bit too soft. Its hinges and latch are good and sturdy, though. As long as you give it ample protection during travel, you shouldn't have any trouble. The 13.3-inch display is adequately bright and provides a nice, clear picture. Teamed up with the 1755's video controller, the display did a decent job playing DVD movies. The only fly in the ointment was that its 4MB of video memory aren't quite enough to avoid a bit of playback hesitation now and then.

Toshiba arranged the notebook's speakers along the top of its front edge, and we thought they sounded pretty good. They're moderately loud and clear, and they didn't distort at all for us, even when we turned them all the way up. We did notice that our

wrists tended to muffle them a bit when we typed, but we could still hear CD music and Windows sounds somewhat. One of the unit's best features is its keyboard, which is both spacious and well arranged. The pointing stick wasn't quite as good, but given the choice, we'd still prefer it to most touchpads, so kudos to Toshiba for building it in.

The 1755 comes with lots of little touches that make it easy to use, such as a set of CD player controls and a volume control button on its front edge. It also has an instant access button that launches your Web browser and your dial-up connection.

**Performance.** The SYSmark2000 performance scores we got from the 1755 were decidedly modest. It produced an 82 in Office Productivity, a 97 in Internet Content Creation, and an overall score of 88, which puts it about 10 overall points behind the last notebook we tested with the same processor, memory, and video control chipset. Its Video2000 scores weren't bad, though. They indicated what we already know: The 1755 isn't a video powerhouse, but it does a great job for a sub-\$1,500 notebook PC. Toshiba lists the 1755's battery life at "2+ hours."

**Final word.** We submit Toshiba's Satellite 1755 as further proof that the current PC market leans heavily in favor of buyers. Of course, technology always gets better and cheaper, but to get a unit with such a rich set of features for \$1,299 is pretty amazing. You probably don't want to do a great deal of video editing or play too many high-tech 3-D games on the 1755, but it's more than equal to most basic computing tasks, and it plays a decent DVD movie to boot. Students, small businesses, and users looking for an affordable second computer should all take a look. 

by Chris Trumble

### Satellite 1755

**\$1,299**  
**Toshiba**  
**(800) 457-7777**  
**(949) 583-3000**  
<http://www.csd.toshiba.com>



# Acer Veriton FP2

Acer's Veriton FP2 all-in-one system is an unusual-looking piece of machinery. The impression we get is that Acer wanted to create a stylish combination of a notebook PC and a desktop PC and ended up with an all-in-one system that is neither portable nor sexy, in our opinion. Still, we respect Acer's desire to create something new, and it's what's on the inside that counts, right?

Users can attach the system's flat-panel display directly to the system or set it up on a monitor stand (sold separately). Without the display, the Veriton FP2 looks somewhat like a hard blue briefcase, the kind of thing you'd think the President's notorious "football" would look like (or *should* look like in any case). This system may not contain the launch codes to our nuclear arsenal, but it does have some power. Let's look at the stats.

The Acer Veriton FP2 uses Microsoft's popular Windows Me operating system and runs on an 800MHz Intel Pentium III processor. The Veriton FP2 has a bus speed of 133MHz, which should be enough juice for most users. The system also has 128MB of SDRAM (synchronous dynamic RAM), which you can increase to a maximum of 512MB of RAM.

The folks at Acer dropped an integrated 2X AGP (Accelerated Graphics Port) Intel 815 video chip into the FP2. We're not so hot on Intel graphics chips, especially for 3-D or graphics applications, but this chip handled 2-D applications quite well, so we can't complain too much. The chip uses 10MB of shared system memory.

One of the FP2's "Wow!" features is the fact that it has hot-swappable drives. It's an interesting way to go for a desktop system. The FP2 comes with a 4X4X20X CD-RW (CD-rewritable) drive. That's a bit slow for our money, considering the latest CD-RW drives are sporting 10X and faster write speeds. Still, we'd take a slow CD-RW drive over no CD-RW drive at all. The 20.4GB size of the Veriton FP2's hard drive is typical for most PCs we've seen lately.

The FP2 has both a 56Kbps (kilobits per second) and 10/100Base-T Ethernet connection, so you can connect to the Internet in whatever way works best for you. If you're into music,

you'd better plan on whistling while you work at this machine: The integrated speakers aren't very good. The sound card is a basic integrated model, but it's not too bad. If you want to listen to some tunes through this system, wear headphones.

We've already rified about the FP2's funky case design. Like we said, we think it's cool that Acer's designers are trying something new. It just doesn't appeal to our sense of aesthetics. There's another thing about this case that does not appeal to us: Acer advises against opening it. The system is *supposed* to be upgradeable, but how can you upgrade a PC when you're not supposed to monkey around in it? Acer, however, recommends that you bring the system in to a local dealer if you want to upgrade it. The system does have plenty of ports, though,



so hooking up external devices won't be a problem. The FP2 has one parallel and serial port and four USB (Universal Serial Bus) ports.

**Testing.** Overall, the FP2 did rather well in our benchmark tests. The SYSmark2000 results were especially good. The FP2's overall score of 139 is one of the better scores we've seen in awhile, especially when you take the system's processor and video chip into consideration.

The Office Productivity score was a solid 130, and the Internet Content Creation score of 152 is excellent.

The Veriton FP2 also made a statement in our Video2000 test. The system's total score in this benchmark was 1,346, which is quite good. The 3Dmarks 2000 score of only 981 was a bit of a downer, as it always is with Intel video chips. Still, 981 is better than average among PCs with an integrated Intel video chip.

Next, we turned to our Quake III test. The game ran pretty smoothly, and we were a bit surprised by this. There wasn't much choppiness in the game at all. The flat-panel display wasn't bad, but we've seen sharper images on other flat-panel displays while playing Quake III at the same resolution.

The Veriton FP2's graphics capabilities aren't too bad, but this system's audio is bad. The two tiny speakers incorporated into the body of the PC simply don't cut it. We tried to listen to an audio CD, but the sound was terrible.

## Features

**Processor:** 800 MHz Intel Pentium III  
**RAM:** 128MB SDRAM  
**Hard Drive:** 20.4GB  
**Optical Drive:** 4X4X20X CD-RW  
**Connectivity:** 56Kbps and 10/100Base-T  
**Graphics Accelerator:** Intel 815  
**Monitor:** 15-inch TFT flat-panel  
**Chassis:** All-In-One  
**System Use:** SOHO (small office/home office)  
**Final Word:** Looks bad, runs well.

We have some mixed feelings about the Veriton FP2. Is the system's design innovative? Yes. Is it ugly? Well, we think so, but some users will undoubtedly dig the design. The FP2 runs well, especially when using office-oriented and other 2-D applications. And that's what counts at the end of the day. If you want a space-saving computer that flies through office documents and is network-ready, the Veriton FP2 will appeal to you. **[S]**

by Michael Sweet

## Veriton FP2

**\$1,800**  
**Acer**  
(800) 733-2237  
(408) 432-6200  
<http://www.acer.com/acer/home/index.htm>



# Samsung SyncMaster 770TFT

**A**imed at the high-end market, the Samsung SyncMaster 770TFT falls short of the performance and imaging capabilities that demanding graphics applications need. Even so, with an affordable price tag and good performance, this monitor still has plenty to offer the business user and average consumer.

In addition to its 1,280 x 1,024 maximum resolution and 75Hz refresh rate, the 770TFT has a reasonable 264 dot pitch. The hinge for adjusting the LCD's (liquid-crystal display's) viewing angle is a bit stiff, however, and the monitor's 18.2-inch high x 17.3-inch wide x 7.2-inch deep footprint means the 18.5-pound LCD takes up a bit more room on the desktop than other displays. It also uses a rather high 42 watts of power when on.

The OSD (on-screen display) menu includes settings for adjusting contrast, brightness, screen position, color temperature, recall, OSD



menu position, and language. An A/B button lets you switch between different video signals.

Installing the 770TFT is simple. The monitor connects to a PC using the traditional 15-pin SVGA (Super Video Graphics Array) D-sub connector. If you run into problems during setup, refer to

the included Owner's Instruction booklet, which covers installing the monitor, and more.

We were impressed with the 770TFT's performance in the basic imaging tests. Video bandwidth images appeared very nice, text looked extremely crisp and readable (though some smaller fonts could have appeared a bit more defined), and blooming among high-intensity objects was minimal. In addition, color registration and linearity were nearly perfect, focus matrixes appeared clean and sharp, and we did not see any moiré patterns in the test screens.

However, the display's color rendering and high-end graphics capabilities were not nearly

as impressive. Although lighting and shading in photos appeared decent and details were sharp and clean, colors appeared too dark, dull, and drab overall to please most serious digital artists. We had to adjust the contrast to near zero to get a decent range of grayscales and color shades to appear on the screen. Even then, some light color shades bled together, and the monitor didn't render several darker shades at all.

As we said, the Samsung 770TFT falls short of being able to handle the high-end applications for which it was originally designed. However, \$1,031 is not bad for a 17-inch LCD, and the monitor performs more than well enough for the basic display tasks most business and home users demand from a monitor. We still think the 770TFT is a solid unit worth your consideration. **[B]**

by Lori Robison

## Samsung SyncMaster 770TFT

**\$1,031**

**Samsung Electronics**

**(800) 726-7864**

**(201) 229-4000**

<http://www.samsungmonitor.com>

# SiPix Pocket Printer A6

**T**he words "portable" and "printer" don't often go together. There are a couple of good reasons for this: technological restrictions and user need. It's tough to miniaturize printer components to make them portable, and most people don't need to print a document out of their briefcase, anyway.

There are those who do need such portability, though, and the SiPix Pocket Printer A6 is a solution for them. It's literally pocket-sized, at 1 inch high x 5.85 inches wide x 4.25 inches deep, and weighing less than a pound with four AA batteries and paper installed. SiPix includes an AC adapter for home use.

The A6 uses time-proven direct thermal printing technology, in which a heating element causes the coated paper to turn black in the correct places. Thus, you have to use specially designed paper, which is somewhat expensive, but you'll want to consider that there are no inks or ribbons to replace.

The A6's setup was frustrating because there's no automation. You're also required to

manually tweak the driver before using the serial connection with your PC.

Another detraction was its lackluster documentation. Ambiguous instructions told us to insert the paper roll with the "whiter" side up: ostensibly the side with the special coating. Sheet paper was to have a black dot designating the back from the front; we saw no dot. We learned the hard way not to squish the paper roll when removing it from the tough protective bag: the paper feeder doesn't have enough muscle to pull from a roll unless it's perfectly round.

After we got it running, the printer was easy to use. The Notepad document we used printed quickly, bettering the manufacturer's 2ppm (pages per minute) rating. Its 400dpi (dots per inch) resolution produced readable fonts. We printed some text from a Palm Pilot using the built-in infrared port. The text printed more slowly, but fonts were larger and came out sharp and black. We saw some occasional, minor blurring with some characters, but we



were impressed with overall text quality.

We also printed some graphical elements to see how the printer would respond. Surprisingly, a few

screen shots of a financial program turned out well. The tiny numbers were still readable, despite the fact they were printed on a grayish background.

Most PC users won't need the extravagance of a pocket printer; it seems like more of a novelty than a real tool. But at only \$150, the A6's price makes it affordable, and it's so easy to use after you've set it up. Palm PDA (personal digital assistant) addicts craving the latest in portable technology will love this unit's potential. **[B]**

by Nathan Chandler

## Pocket Printer A6

**\$149**

**SiPix**

**(408) 719-8888**

<http://www.sipix.com>

## Minolta Dimage 2330 Zoom

**M**inolta is one of the most familiar and respected names in the photography world. That's why we were somewhat disappointed with the overall performance of the company's two-megapixel Dimage 2330 Zoom digital camera.

The Dimage 2330 uses the company's previously released Dimage 2300 as a foundation to build from. The camera provides shooting resolutions of 1,792 x 1,200 pixels and 896 x 600 pixels and stores images as JPEG (Joint Photographic Experts Group) files to a bundled 8MB CompactFlash memory card in Fine, Standard, and Economy quality settings.

Images we shot were generally disappointing, considering the two-megapixel resolution used to shoot them. Our shots featured mostly darker colors and visible blurriness in many images. We were far more pleased with shots we took outdoors, which were brighter and more vivid. Overall, the shots rate about average compared to other two-megapixel models we've seen.

More positive and noteworthy is the camera's durable frame and simple design, which utilizes a four-way jog button. In addition, a mode dial

(play, camera, PC, and setup modes) and three additional buttons help navigate the camera's text-driven menus. Combined, the dial and buttons make operating the camera an especially easy endeavor. We can't imagine even a new user having much trouble taking shots shortly after unpacking the camera.

The camera's 8mm-to-24mm lens (equivalent to a 38mm-to-114mm lens on a 35mm camera) has 3X optical zoom and 25X digital zoom. In addition, the camera has a five-mode built-in flash and macro mode to shoot objects as close as 1.6 inches. The black-and-silver Dimage 2330 also lets you access a burst mode that snaps 2fps (frames per second) up to four images. It also includes a motorized lens cover that opens and closes when the power is turned on and off.

The camera's focus and exposure settings are handled automatically, as are the white balance duties. However, there are preset

white balance modes for Daylight, Tungsten, and Fluorescent lighting. Overall, the limited amount of manual options available will limit your creativity.

Minolta bundles the camera with a USB (Universal Serial Bus) cable to transfer images, Adobe PhotoDeluxe Home Edition software, and four AA alkaline batteries, although you

can use rechargeable batteries.

At \$440, the Dimage 2330 Zoom is a bit pricier than other two-megapixel models with similar abilities, but it should handle basic tasks new users will put to it. **B**

by Blaine Flamig



### Dimage 2330 Zoom

**\$440**

**Minolta**

**(800) 528-4767**

**(201) 825-4000**

<http://www.minoltausa.com>

## Palm m105

**T**he release of the Palm m100 marked the beginning of the end for the Palm III series. With the release of the m105, we can safely say the Palm III series is dead.

The m105 is very similar to the m100 in most respects. It has the same removable faceplate design, the same Palm OS (version 3.5) and the same 16MHz Dragonball processor. None of these are exactly top of the line. Palm announced Palm OS 4.0 when it announced the m500 and m505 models in mid March. The 16MHz Dragonball processor is about two generations behind the 33MHz processor used in the new m500 models. The m100 and m105, however, are meant to be introductory models and the 16MHz processor has more than enough power for most new users.

The m105 has 8MB of RAM, while the m100 has 2MB. The extra storage space is nice if you

want to install a lot of third-party applications or reference materials. Like the m100, the m105 also includes the popular Notepad application, that lets you draw directly on the screen without having to enter text using handwriting recognition software. It also includes Pocket Mirror, a conduit for Microsoft Outlook. The m105 comes with an older version of the Palm desktop, although you can download the Palm Desktop 4.0 from Palm's Web site.

The m105 is the same size and weight as the m100 (4.66 inches high x 3.12 inches wide x 0.72 inches deep; 4.4oz). It's small and light enough to carry easily.

The display is good, but as we mentioned in our review of the m100, the new design does feature a smaller screen. If you're new to PDAs (personal digital assistants), you probably won't miss the extra real estate, but if you're already a Palm user, you might be a little disappointed.

All add-on devices for the m100 are compatible with the m105. Available accessories include

cases, styli, keyboards, and a backup module. Unlike the m100, the m105 also comes with a docking cradle instead of just a cable.

The m105 is also the first Palm model to ship with the Palm Mobile Internet Kit. The kit, available from Palm for \$39.95, is a software package that lets you use a data-enabled mobile phone or a Palm OS compatible modem to connect to the Internet. You'll need a modem or cell phone with an infrared port or a special cable to connect the phone or modem to your Palm. The Palm Mobile Internet Kit only contains the software. Any cables are sold separately.

Considering all the extras that come with the m105, the unit is definitely worth its \$199 price (\$50 more than the m100). **B**

by Chad Denton

### m105

**\$199**

**Palm**

**(800) 881-7256**

**(847) 262-7256**

<http://www.palm.com>



# Apple Power Mac G4

It's true that we at *Smart Computing* focus most of our attention on reviewing Windows-compatible PCs. But even Windows users can admire the beauty and brute strength of the Power Mac G4 system from Apple. It's the definition of style, but this computer doesn't rely solely on its good looks. It has a solid processor than can whip through most applications very quickly. We climbed aboard this Apple cart and went for a ride.

The Power Mac G4 system we tested used Apple's Mac OS 9.1 and ran on a 533MHz PowerPC G4 processor. The system has a 133MHz bus speed, which is as fast as the system bus on most new Windows PCs. And, like most Windows PCs, the Power Mac G4 comes with 128MB of SDRAM (synchronous dynamic RAM) standard. Unlike most PCs, however, you can add up to a total of 1.5GB (yes, that's *gigabytes*) of RAM to the Power Mac G4. Windows PCs typically top out at about 512MB. If 1.5GB isn't enough RAM for you, you need counseling. There are three RAM slots total, two of which are empty.

Obviously, the Power Mac G4 has the RAM covered; it also packs a good graphics card. The system uses NVIDIA's agile yet affordable GeForce2 MX graphics card. It runs at 4X AGP (Accelerated Graphics Port) and has 32MB of video SDRAM. The Power Mac G4 doesn't come with a display, but Apple has a few that you can add as an option, from a \$499 17-inch monitor to a \$3,000 22-inch flat panel display. That's about \$136 an inch, for those of you keeping score at home.

The Power Mac G4 has an 8X4X32X CD-RW (CD-rewritable) drive so you can make perfectly legal copies of music you already own. We've seen a few bargain systems lately that only have a 4X4X24X CD-RW drive, so it's nice to see Apple kick it up a notch or two. We're a little disappointed that this system doesn't include a DVD drive because we're pretty sure that the Power Mac G4 would be a great platform for it. But whadd'ya expect for only \$2,199?

The CD-RW drive is the only external storage drive that comes with the system. The Power Mac G4 has no floppy diskette drive,

Zip drive, tape drive, or front-wheel drive, for that matter. It does have a very generous 40GB hard drive, though.

Other features of note: the Power Mac G4 uses an optical mouse that we're very fond of. It's much more comfortable and responsive than the early iMac medallion-shaped mice. This system also comes with a basic 56Kbps (kilobits per second) modem. The speakers, like the rest of the system, look very cool and sound better than most PC speakers.

The Power Mac G4 has a rather large case, but there's plenty of room to mess around inside if you are into that sort of thing. The system has four available PCI (Peripheral Component Interconnect) slots, as well as an AGP slot. There are three 3.5-inch drive bays in the Power Mac G4, two of which are open. You'll also find two 5.25-inch drive bays, but only one of these is available.

You can tell that the Power Mac G4 is a forward-looking system because it has no serial or parallel ports. Instead, it's loaded with six USB (Universal Serial Bus) ports and two FireWire (IEEE 1394 in PC-talk) ports. That's a lot of ways to get plugged in.

**Benchmarks.** We run a whole battery of benchmarks when we test Windows-based PCs. However, our benchmarking software doesn't come in a Mac version, so it's not easy for us to compare the speed and power of the Power Mac G4 to a non-Apple system. We have to use some rather subjective analysis to gauge this system's abilities. We played around with the system, listened to some audio CDs, and ran a few programs. We found the Power Mac G4 to be a fast, responsive system.



We did run a Mac version of Quake III on this system, which is one of the tests we run on our Windows PCs. The Power Mac G4 seemed to run Quake III better than most of the Windows PCs we've reviewed lately,

#### Features

**Processor:** 533MHz PowerPC G4  
**RAM:** 128MB SDRAM  
**Hard Drive:** 40GB  
**Optical Drive:** 8X4X32X CD-RW  
**Connectivity:** 56Kbps modem  
**Graphics Accelerator:** NVIDIA GeForce2 MX  
**Chassis Type:** Mid-tower  
**Monitor:** Sold separately  
**System Use:** Home use  
**Final Word:** Very nice, though a bit expensive

although a couple of our top-of-the-line systems seemed to run the game more smoothly than the Power Mac G4.

If you are a Mac fan, this system will undoubtedly encourage you to keep singing Apple's praises. Windows fans might not dig the Mac OS, but the system itself is a powerhouse, and it'll look good on your desk, too. [S]

by Michael Sweet

#### Power Mac G4

\$2,199  
Apple  
(800) 692-7753  
(408) 996-1010  
<http://www.apple.com>

## NEC MobilePro 780

The NEC MobilePro 780 is larger than some other handheld computers, but NEC uses the extra size to provide a much more spacious keyboard and a larger display that adds to the overall usability of the hardware.

The NEC MobilePro 780 is a half-VGA (Video Graphics Array) clamshell device measuring 1.1 inches high x 9.64 inches wide x 5.2 inches deep and weighs 1.69 pounds with its included Li-Ion (lithium-ion) battery. The extra size provides an 8.1-inch screen and a 73-key keyboard with a 17.5mm pitch.

The keyboard is close enough to full size that it's easy to touch type on. Of course, larger keyboards increase the size of the handheld, so you'll need to balance your need to enter information easily with your need for portability.

The DSTN (double-layer supertwist nematic) passive matrix touch screen can't compare to the active matrix displays you find in notebook PCs. Compared to many other handheld displays, however, the 780's screen is bright and readable. But like other displays, it tends to fade outdoors under the bright sun.

The MobilePro 780 comes with a variety of expansion and communications ports, including



serial and IrDA (Infrared Data Association) ports, a Type II PC Card slot, and a Type II CompactFlash slot. It also features a VGA output port that lets you connect the device to a standard monitor. A V.90 modem provides Internet connectivity. Internally, the unit has a VR4121 MIPS-based processor running at 168MHz and 32MB of RAM.

All of this internal hardware provides for decent performance and storage. Applications opened quickly, but Web browsing was slow. The problem isn't the modem but the time it takes the system to render graphically intense Web pages.

The unit comes with Windows CE 2.11 (also known as Windows CE Professional) and basic

office applications, including Pocket Word, Pocket Access, Pocket Excel, and Pocket PowerPoint. By the time we received our review unit, the software was slightly outdated.

The 780 stores its operating system in a removable ROM chip that you could physically upgrade if NEC decides to release a ROM update. The unit also came with bUSEFUL Backup, which lets you back up your system to a CompactFlash card, and bUSEFUL Script, which lets you create scripts to automate complex tasks. NEC also included MobilePro Fax for sending faxes.

At about \$830, the MobilePro 780 is priced a little behind more up-to-date handheld PCs, but it's still worth the money. It's a little larger than other handhelds on the market, but it makes up for its size with a larger screen and better keyboard. **GB**

by Chad Denton

### MobilePro 780

\$830

NEC

(800) 632-4525

(214) 262-2000

<http://www.neccomp.com>

## AVerMedia AVerKit 2.5" (1394)

If you're replacing your notebook computer's 2.5-inch EIDE (Enhanced Integrated Drive Electronics) hard drive to gain storage space, consider what you'll do with your old drive. Here's an idea: Put it in a shell and turn it into a portable, external drive that will outclock most removable cartridge and optical drives. Better still, give it IEEE 1394 (FireWire) ports for fast, hot-pluggable connections to your 1394-equipped Windows 98SE, Me, 2000 or Macintosh OS 9.0 computer.

AVerMedia's AVerKit external drive case is trim and stylish at 0.88 inches high x 3.13 inches wide x 5.19 inches deep. It has twin 1394 ports to allow daisy-chaining devices and a jack for a power adapter (not included). It can also draw power through the included 1394 cable. The idea is to open the AVerKit's case, install your old drive, and screw it all together.



You may wonder why anyone would even bother to make a 2.5-inch drive external. After all, most run at 4,200 rpm (revolutions per minute) or less, quite a bit behind the 5,400rpm and 7,200rpm 3.5-inch hard drives common to desktop computers. For one thing, 2.5-inch drives are a lot tougher than their 3.5-inch counterparts. They're also much lighter and thinner and don't guzzle as much battery power from your notebook.

The AVerKit can handle sustained data transfers of about 25MB per second, peaking at 50MBps. This nears 1394's 51.2MBps theoretical limit. We could not test

the AVerKit in the usual way; without another 1394 adapter kit to compare with it, any data transfer speed tests would have been meaningless.

We did install a drive in it, though, and were impressed at how easy it was to use once it was assembled.

The downside to the AVerKit is that it would be easy to ruin it as you install your hard drive. You have to slide your drive along the circuit board itself to join the data connectors, and it's a tight fit. One slip of the screwdriver as you tighten the circuit board to the drive and you could scratch something important. Finally, the AVerKit isn't compatible with Sony VAIO PCs.

Even with a zippered, padded leather case, we're still not sure we would pay \$150 for an external drive kit. After all, that's more than some new 2.5-inch Toshiba or Hitachi internal drives cost. Still, the AVerKit can breathe new life into your old notebook drive and do it with style. **GB**

by Marty Sems

### AVerKit 2.5" (1394)

\$150

AVerMedia

(408) 263-3828

<http://www.avermedia.com>



# NEC Versa LXi 850



**T**he new LXi is the biggest and fastest NEC notebook available as of this writing, and it competes comfortably with heavy hitters from each of the top several notebook companies. Everything about the notebook is big, from its 15-inch display to its 8-pound weight. Big is good for a desktop replacement notebook, but don't expect to get all this big cheap; its price tag is just as big, ringing in at \$4,199 as tested.

**Specifications.** Although Intel's 1GHz mobile Pentiums are on the way (and may be available as you read this), when we got our review unit, the 850MHz Pentium III inside was still top dog. NEC does the right thing and makes 128MB of RAM standard, and provides a 20GB hard drive for permanent storage. Its right edge houses an internal 1.44MB floppy diskette drive, and a modular 6X DVD-ROM drive fits into NEC's VersaBay III modular device bay on its front edge. The VersaBay III alternately holds a variety of optional devices, including a 24X CD-ROM drive, a CD-RW (CD-rewritable) drive, a SuperDisk 120MB drive, or a second hard drive. You can also plug a second battery into the bay to complement the LXi's standard 10.8-volt Li-Ion (lithium-ion) battery or just to cover the bay with an included weight saver module.

The LXi measures 2 inches high (when closed) x 12.8 inches wide x 10.6 inches deep, and contains pretty much all the standard equipment you'll need. It has both a 56Kbps (kilobits per second) modem and an Intel Pro/100+ MiniPCI network adapter. Its 15-inch TFT (thin film transistor) display is very nice, but we were a bit surprised at NEC's decision to

include S3's Savage/IX video chipset (although it did come with 18MB of video memory). Most of the NEC models we've reviewed in the past have come with ATI Technologies' more popular RAGE chipsets, and we've found that they generally perform considerably better than S3-equipped models.

Our review unit arrived with Windows 2000 Professional preinstalled, as well as an application CD including Adobe Acrobat Reader, Norton AntiVirus, and PartitionMagic Special Edition.

**Design.** The LXi has NEC's classic square, gray Versa look, although its magnesium-alloy lid panel creates a sort of two-tone effect. The lid is good and stiff and doesn't let the lid panel flex very much under moderate pressure, a good sign for travelers. The rest of the case is flexible in parts but doesn't seem at all flimsy and should do a good job of protecting the notebook's components. As we mentioned earlier, we like the picture quality the display provides, and the speakers on the front edge complement it nicely. They provide good, clear sound and don't seem to distort a bit.

NEC has done a great job with its input devices on the units we've reviewed lately, and the LXi continues the trend. Its keyboard is deep, with large, springy keys that are both comfortable and easy to find. We did have a bit of trouble with typos thanks to the HOME key to the right of the BACKSPACE key, but aside from that typing on the LXi was a pleasant experience. The touchpad below was a little stodgy at first, but we quickly fixed that by cranking our pointer speed up from within the Control Panel.

**Performance.** The LXi's 850MHz Pentium III turned in some pretty impressive BAPCo SYSmark2000 performance scores, including a 173 in Internet Content Creation, a 156 in


Office Productivity, and a 163 overall. These marks are about average among 850s we've tested, so it appeared the notebook's S3 video chipset hadn't hindered it too much.

Then we ran MadOnion.com's Video-2000, a benchmark we've started using as we transition away from MultimediaMark99. Video2000 gives scores based on how a PC's video chipset works with its CPU, memory, and motherboard to create and manipulate high-quality graphic images. It received a Video Marks score of 989, or about half of what other 850MHz notebooks have received so far (all of which have been equipped with ATI graphics controllers).

**Final Word.** Although its graphics controller hindered it a bit, the Versa LXi 850 put up great basic performance numbers, and we liked everything about it. It has a comfortable keyboard, an intuitive touchpad, and great multimedia equipment. The question most shoppers will have to ask themselves is whether it is good enough to justify spending several hundred dollars more than

#### Features

**Processor:** 850MHz Pentium III  
**RAM:** 128/512MB  
**Display:** 15-inch TFT (thin film transistor)  
**Dimensions (inches):** 2 x 12.8 x 10.6  
**Weight (pounds):** 8  
**Hard Drive:** 20GB  
**Optical Drive:** 6X DVD-ROM  
**Connectivity:** 56Kbps modem, Ethernet  
**Final Word:** There's a lot to like about the LXi, including a large, beautiful display; great input devices; and solid basic performance scores. Its graphics controller keeps it from high video scores, however, and some buyers will find its price prohibitive.

similarly equipped notebooks from IBM, Acer, and WinBook. 

by Chris Trumble

#### Versa LXi 850

**\$4,199**  
**NEC**  
**(888) 632-8701**  
**(631) 753-7000**  
<http://www.nec-computers.com>



# HP Pavilion 7840

The Hewlett-Packard Pavilion 7840 looks exactly like the HP Pavilion 7850. Peel back the Pavilion 7840's skin, however, and you'll see that it's quite different from the other system. The Pavilion 7850 has several components that are more powerful than the components you'll find in the Pavilion 7840, but it only costs \$250 more. We think it's worth the extra pesos to skip the Pavilion 7840 in favor of the more powerful system. Let's check out the details.

The Pavilion 7840 has a 766MHz Intel Celeron processor and uses the Windows Me operating system. The system's bus speed is only 66MHz, which seems rather sluggish as more and more PCs move up to 133MHz or faster system buses. Another minor drawback of this system is that it only has 64MB of SDRAM (synchronous dynamic RAM). Some lower-end systems have as much as 128MB of memory. Happily, you can increase this system's RAM to 512MB.

HP uses an integrated Intel 82810 chip running a 2X AGP (Accelerated Graphics Port) to power the graphics on the Pavilion 7840. The video chip uses 11MB of shared system memory. The Intel video chip is cheap, but the



half the price of the whole system for those of you keeping score at home).

The Pavilion 7840 has a 4X4X24X CD-RW (CD-rewritable) drive, which we think is a nice feature. A CD-RW read speed of 4X is rather slow by today's standards; most new CD-RW drives can write at 8X or faster. But most users can live with 4X when the total system cost is less than \$750. HP also kicks in a 48X CD-ROM drive if you need a little more speed for reading your CD-ROMs.

HP also includes a sizeable 30GB hard drive on this system, which should satisfy your storage needs for quite awhile. The sound card and speakers are not very satisfying, however.

Actually, the integrated Crystal sound chip isn't too bad, but the small Polk satellite speakers are tinny and produce almost no bass whatsoever. As for connectivity, the Pavilion 7840 has a 56Kbps (kilobits per second) modem.

Be prepared for a tight squeeze if you want to fiddle around in this

case. Also, the system has no AGP slot, so you'll either have to live with the integrated Intel graphics chip or buy a PCI (Peripheral Component Interconnect) video card if you want better graphics. Only one of the three PCI slots is available, however, so choose wisely.

The Pavilion 7840 is a little short on extra bays also. The system has three 3.5-inch bays,

one of which is available. There are also two 5.25-inch bays, but both of these are already in use. This system has the usual assortment of ports: two USB (Universal Serial Bus), two serial, and one parallel.

**Benchmarks.** The Pavilion 7840 huffed and puffed but could not blow our benchmarks away. It seems that the \$750 mark is the magic number: PCs that cost between \$750 and \$1,000 tend to perform OK, if not great, in our benchmarks. But those below \$750 really have trouble in our tests.

The Pavilion 7840 struggled through the SYSmark2000 test. The system's overall score was a paltry 74, with an Office Productivity score of 73 and an Internet Content Creation score of only 75. That's just not very good.

The Video2000 numbers weren't much better. At the end of the day, the system's total Video2000 score was only 961, which is one of the lowest scores we've seen in this test in quite awhile. The 3Dmarks2000 score of 742 is also disappointing, even for a system using an Intel video chip. And that's saying something.

We weren't especially excited to pop Quake III into this system because we figured it wouldn't exactly be fun. As we expected, the game was quite choppy at higher resolutions. Actually, it was still a bit sluggish at lower resolutions. But at least the game was playable.

Our audio test also wasn't inspiring. The Polk speakers that HP ships with the Pavilion 7840 simply don't have very much power. Therefore, they don't sound very good. You're better off listening to your tunes through a good set of headphones.

Penny pinchers who want a system that can handle basic e-mail, Internet, and light document creation can get by with the Pavilion 7840, but we think it's worth it to spend a little more money on HP's Pavilion 7850 or another higher-quality system. [E]

by Michael Sweet

## Pavilion 7840

\$749

Hewlett-Packard

(888) 999-4747

(650) 857-1501

<http://www.hp.com>

### Features

**Processor:** 766MHZ

**RAM:** 64MB SDRAM

**Hard Drive:** 30GB

**Optical Drive:** 48X CD-ROM; 4X4X24X

**Connectivity:** 56Kbps modem

**Graphics Accelerator:** Integrated Intel 82810

**Monitor:** Sold separately

**Chassis:** Mid-tower

**System Use:** Home use

**Final Word:** Good for the basics, but if you want anything more, spend another \$250 to get the HP 7850.

graphics definitely suffer. If you're a gamer, you'll probably want a system with a more robust video chip.

This system doesn't come with a monitor, but HP sent us a 17-inch HP Pavilion MX 70 monitor to test with the Pavilion 7840. We really liked the monitor, and you can add it to this system for a wallet-popping \$399 (that's over



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## Promise Technology Ultra100

If you buy a new EIDE (Enhanced Integrated Drive Electronics) hard drive today for a computer built before 2000, chances are the PC is not equipped to handle the hard drive's top speeds. A system using an ATA/33 (Advanced Technology Attachment 33MBps [megabytes per second]) or slower controller, as most desktop PCs were in 1999, will artificially limit the high read and write speeds of current drives.

For about \$45, you can install a PCI (Peripheral Component Interconnect) card in your system that will uncork your new hard drive's true potential. Promise Technology's Ultra100 controller card will upgrade your computer to the UltraATA/100 interface (also compatible with ATA/66, ATA/33, and slower EIDE drives).

This means that with one of today's UltraATA/100 hard drives and an ATA/66 or ATA/100 ribbon cable (which has 40-pin

connectors but 80 wires), you could enjoy up to 40MBps data transfers. Better still, if your computer requests data that your hard drive recently retrieved, that data might still be in the drive's cache memory. Without having to "look up" the data again on disk, a current hard drive might send it at up to 60MBps.

We recently tested one of Fujitsu's excellent MPG3204AH 20.4GB hard drives on a 450MHz Pentium III IBM PC with 128MB of RAM, Windows 98SE, and a HighPoint HPT370 DMA/100 controller. (NOTE: DMA [direct memory access] and ATA are compatible EIDE technologies. The number of MBps each can carry is the important thing.) When we installed the Promise Ultra100 card and retested, the HD Tach 2.6 benchmarking utility listed slightly faster (0.1MBps to 0.2MBps) average and maximum write rates for the Fujitsu (21.3MBps and 24.3MBps,



respectively). The HighPoint controller let the hard drive score a slightly better (0.1 millisecond) random-access time (12.8ms), but both controllers carried the same average and maximum read rates for this drive (34.0MBps and 39.3MBps, respectively).

If you were to plopp this ATA/100 Fujitsu hard drive into an older PC with a built-in ATA/33 controller, such as our system's Intel 82371AB/EB controller, it would limit its read rates to 25.5 to 27MBps and its write rates to 14.7 to 15.9MBps. That's roughly a 25% to 35% drop.

We had different problems installing the Ultra100 on two separate systems, so be sure to back up your hard drive before you try to install one. Also, have another, working PC handy to log on to Promise's Web site for new drivers or troubleshooting information. [E]

by Marty Sems

### Ultra100

\$45

Promise Technology

(800) 888-0245

(408) 452-0948

<http://www.promise.com>

## Logitech Cordless TrackMan FX

If you're serious about the quality and comfort of your pointing devices, you may want to consider the ergonomic Logitech Cordless TrackMan FX. This optical trackball is curved to comfortably fit the contours of right-handed users, and all of its options are within easy reach.

Powered by a single AA battery, the TrackMan FX uses radio waves to communicate from up to 6 feet away with a radio receiver connected to your Windows 95, 98, NT, 2000 or Mac OS 8.6 or newer system. A USB (Universal Serial Bus) connector makes installing the device simple. However, you can also use the accompanying PS/2 adapter if your system doesn't have any USB ports.

We like that the Logitech trackball is designed for the user to primarily control it with the forefinger. There's also a small space for your thumb to guide the ball, which glides smoothly and easily. This combination of forefinger and thumb control allows for maximum movement precision and lets you easily zero in on Desktop icons. In addition, the

device's four buttons are easy to reach, regardless of the size of your hand. The TrackMan FX even comes with a detachable wrist rest that you can adjust right or left to fit the position of your arm while holding the pointing device.

Setting up the TrackMan is simple. After installing the drivers, we simply turned off the computer, unplugged our old PS/2 mouse, plugged the trackball into the system's PS/2 connector, and rebooted the computer. If you use the unit's USB hub, you won't have to reboot your system. Just plug the unit in and install the software; you're ready to go.

As with most Logitech input devices, the included software is very simple to use; it makes setting up and customizing the device easy, even for beginners. The TrackMan FX comes with Mouseware 9.14, which includes

options for assigning your own functions to two of the trackball's buttons. A Getting Started Guide walks you through installation, setup, and troubleshooting, and the Comfort Guidelines instruct you on the proper way to hold and use the trackball.

There aren't too many negative things to say about the Logitech TrackMan FX, other than the \$80 price tag, which struck us as a little high for a pointing device. However, the TrackMan's five-year warranty may justify the cost. In any case, it's definitely an extremely comfortable, precise pointing device that's at least worth a look. [E]

by Lori Robison

### Cordless TrackMan FX

\$80

Logitech

(800) 231-7717

(510) 795-8500

<http://www.logitech.com>

## Toshiba SD-P1000

Not only is DVD hardware coming down in price, but it's also getting smaller. A number of companies including Panasonic, Sharp, and Toshiba have portable DVD players on the market. We took a closer look at Toshiba's portable offering, the SD-P1000.

The SD-P1000 measures just 1 inch high x 5.63 inches wide x 5.88 inches deep when closed (7.88 inches deep with battery) and weighs just 1.5 pounds (2.2 pounds with battery).

An array of outputs let you connect the SD-P1000 to nearly any home theater system. The unit supports both Dolby Digital and DTS (Digital Theater System) surround sound formats and includes both coaxial and optical sound outputs. SD-P1000 also includes Toshiba's ColorStream video output and standard S Video output. You can also connect the player to a TV using standard red, yellow, and white RCA connectors. If you have an ATAPI (Advanced Technology Attachment Packet Interface) PC Card for your notebook, you can connect the drive to a notebook using the included cable.

We were impressed with the 5.8-inch wide LCD (liquid-crystal display) screen. Color was

bright and crisp, and lines were clear and sharp. The two on-board speakers were a bit of a disappointment compared

to the screen, but it's hard for two speakers to give DVD audio true justice. The unit's N-2-2 Virtual Surround Sound attempts to emulate surround sound using the on-board speakers, but it's really not the same.

The unit's battery is a bit of a disappointment. According to Toshiba, the rechargeable lithium-ion battery will last 140 minutes, which is long enough for some movies, but it may not be able to get you to the end of some Hollywood epics. For instance, the battery held out for about 150 minutes of "The Patriot." Although this is a little better than Toshiba's estimate of 140 minutes, it was still 14 minutes shorter than the movie. Other DVD players from Sharp and Panasonic have batteries rated at 3.5 hours, which should be long enough to make it to the end of almost any movie.

We connected the SD-P1000 to a home theater setup using S-Video to connect the player

to the television and coaxial cable to connect the player to a Dolby Digital receiver. The unit performed well, and we didn't notice any difference in quality between the portable player and our

midrange standard DVD player. The unit is also very stable. Repeated shaking and jarring didn't produce a single skip.

All this portable movie goodness comes at a hefty price. Toshiba lists the unit at \$1,799. We did find the SD-P1000 online for much less than that, often finding it for less than \$1,000. Still, this is a much greater investment than

a standard DVD player, but one that may be worth the money if you travel frequently. **[B]**

by Chad Denton



### SD-P1000

\$1,799

Toshiba

(800) 631-3811

<http://www.toshiba.com>

## UMAX AstroCam 1800

The best thing we can probably say about the AstroCam 1800 from UMAX is that the camera's price is hard to beat. Retailing for just \$199, you'll probably be able to pick the camera up for even cheaper. And that's impressive, considering the camera offers megapixel quality and is about as easy to use as a point-and-shoot 35mm camera.

The camera's price tag will lead you to believe the 1800 is lacking a few features, and it is. For starters, there's no LCD (liquid-crystal display), so you'll have to frame your shots with the optical viewfinder. That also means you won't be able to review shots you've just taken. In addition, the camera lacks a serial port, instead using a USB (Universal Serial Bus) connection to transfer

images from the camera to the computer. This is a preferable method, but if your computer lacks a USB port, you'll have to use a removable card reader.

On the plus side, the AstroCam 1800 is exceptionally easy to use. After inserting the two AA alkaline batteries needed to run the camera, we had it snapping shots almost instantly. Beyond switching flash settings (auto, forced, and off) and the image quality between Economy, High, and Super High modes, there isn't much else to manipulate. The fixed-focus lens focuses objects from 6cm to infinity, and the exposure is automatic.

The camera shoots at a true resolution of 1,280 x 960 pixels, but you can bump that up to 1,600 x 1,200 pixels with interpolation

software. However, we don't recommend using your images for much more than Web purposes or prints larger than 5 x 7 inches. Our shots were about average compared to other entry-level models, with some of the images being overly dark and a bit blurry. Much of the darkness can be attributed to the fact that the camera has no ability to make manual adjustments.

The AstroCam 1800 does ship with a 4MB SmartMedia card and is small enough to fit snugly in a pocket to take with you. In addition, it has a fairly sturdy frame for a sub-\$200 model. The AstroCam won't win any awards for its overall quality, but for a model with megapixel quality and wonderful ease of use at an extremely affordable price, it isn't bad. **[B]**

by Blaine Flamig

### AstroCam 1800

\$199

UMAX

(800) 562-0311

(510) 651-4000

<http://www.umax.com>





## Visioneer OneTouch 8800 USB

The Visioneer OneTouch 8800 USB comes with enough timesaving features and other options to handle most scanning tasks that can crop up in a home or small office. And its overall imaging capabilities aren't bad, either.

The 4-inch high x 11.7-inch wide x 16.7-inch deep scanner has seven one-touch buttons that you can use to quickly scan images to your scanning software, a copier, fax machine, e-mail program, another application of your choice, and more. In addition, the 6.2-pound 8800 features a 24-bit output bit depth and 1,200dpi (dots per inch) resolution capabilities.

But the neat feature with this machine is its Visioneer Scan Manager Pro scanning software, which expands the capabilities of the 8800 nicely. For example, a batch scan feature lets you scan in multiple images as one document, saving you time with large scanning jobs. You can also set a wide range of output resolutions, from 50dpi and up, to suit your particular scanning task. In addition to the basic brightness, contrast,

and gamma settings, the scanning software even includes blur/sharpen filters and settings for reducing moiré patterns in images.

Other accompanying software includes ScanSoft PaperPort Deluxe 7 for managing documents, Adobe Photoshop 5.0LE, ScanSoft TextBridge

Pro 8, Adobe Acrobat Reader 4.05, and PhotoEnhancer 3.1. Visioneer also includes a 30-day trial of Quick! Expenseable, as well as an AOL 5.0 CD-ROM that you can use to sign up for Internet access.

In addition to electronic users manuals, a printed Installation Guide walks you through the scanner's installation and setup. Although installation is pretty easy using the machine's USB (Universal Serial Bus) connector, a Quick Install Card also gives you step-by-step setup instructions if you run into problems.

We were pleased with the 8800's scan times, which ranged from a speedy 0:10 (minutes/seconds) for a 150dpi large color photograph to an acceptable 7:57 for the same image scanned at



1,200dpi. In addition, it rendered sharp images that appeared very comparable to the original prints. It also performed well in our color-block test, rendering a wide range of light and dark shades. Moreover, color transitions within photographs appeared smooth, and flesh tones looked realistic. It rendered 27 shades of gray in our grayscale test and provided good shading and detail on a black-and-white photo test scan. Graphics also appeared clean and even, and text document scans were crisp and very readable.

With so much going for it, the OneTouch 8800 has what it takes for most basic scanning needs. Graphics designers and users wanting high-quality, professional color rendering should probably look elsewhere. But for \$167, small-office and home users could do a lot worse than the 8800. [A]

by Lori Robison

### OneTouch 8800 USB

\$167

Visioneer

(888) 229-4172

(925) 251-6300

<http://www.visioneer.com>

## Envision EN-980e

If you need a solid 19-inch monitor at a low cost, the Envision EN-980e might be just what you're looking for. The CRT (cathode-ray tube) display has an 18-inch viewable area and displays better than average overall detail and excellent color registration.

It weighs in at a hefty 44 pounds and makes a good-sized footprint (18.3 inches high x 18.1 inches wide x 18.5 inches deep); however, the casing diminishes in size toward the back, which will serve you well if the monitor needs to go in the corner of a desk or cubicle. Regardless of where you put it, the very competitive \$299 price tag might make you feel better about losing some extra desk space. The design is unspectacular, and picture

adjustment is limited, so in this regard you get what you pay for.

We evaluated the monitor on an IBM running Microsoft's Windows 98 operating system and employing a 450MHz Pentium III with 128MB of RAM and a powerful Asus v7700 GeForce2 GTS video card.

We looked at a Microsoft Word document and an Excel spreadsheet and were a little disap-

pointed by the fuzziness of the text; this jibed with the significant blooming and halo effects we noticed during our diagnostic tests. The effect improved a little when we used a larger font, but if you're going to be doing a lot of word processing and spreadsheet creation, it might be more of an annoyance than you're willing to put up with. Changing the resolution made no noticeable difference when viewing these files.

Where this monitor shines is in its steadfast presentation of sharp, rich color. We looked at

some complex photographic images and zoomed in close and were extremely impressed with how the level of detail held up under scrutiny. Our only complaint is that some colors were slightly flat: Flowers looked like they were part of a painting rather than a photograph, and some images didn't shine as brilliantly as they could have. Overall, though, the EN-980e excelled in this category.

The monitor held up equally well at a 1,024 x 768 pixel resolution and the maximum 1,600 x 1,200 resolution. Its OSD (on-screen display) is comprehensive and reasonably easy to use. It also scored high in our tests for consistent color scale and extreme grayscale. Whether you're looking for a monitor to use with design software or games, the EN-980e is worth a good look. [A]

by Cal Clinchard

### EN-980e

\$299

Envision Peripherals

(888) 838-6388

<http://www.epius.com>



# WinBook J1 1000



**W**inBook has been around for several years now, and for the most part we've liked its products quite a bit. They have nearly always been functional units that perform well, but we have secretly wondered for some time why the company didn't do more to differentiate its various product lines. Sure, having different models that use similar chasses and cases is handy and helps keep costs down, but we wouldn't like it if car companies used the same bodies for all their models, would we?

Little did we know (prior to last year's fall Comdex in Las Vegas, that is) that the

Specifications. WinBook designed its 1GHz J1 prior to the advent of Intel's mobile 1GHz chips, so the one in the J1 is really a converted desktop CPU. This of course creates interesting questions about heat dissipation and battery life, but WinBook seems to have answered them. The notebook comes with 128MB of RAM in its standard configuration, but you can upgrade it to 256MB for another \$199 at purchase. The notebook also includes a 10GB Fujitsu hard drive, an integrated 8X Torisan DVD-ROM drive, and an integrated 1.44MB floppy diskette drive, and gives you simultaneous access to them all.

The 14.2-inch high x 12-inch wide x 9.53-inch deep J1 also sports a 14.8-volt Li-Ion (lithium-ion) battery, a 13.3-inch TFT (thin film transistor) display, and a Trident CyberBlade video chipset to go along with it. The CyberBlade comes with AGP (Accelerated Graphics Port) support, but unfortunately doesn't come with its own video memory, instead sharing from 2 to 8MB of system memory with the J1's CPU. The difference between dedicated and shared video memory is the J1's Achilles' heel, and it showed up in a big way during our benchmark testing (more on this later).

WinBook ships the J1 with an internal 56Kbps (kilobits per second) modem for Internet connectivity and with Windows Me preinstalled as its operating system.

Design. Getting away from its traditional boxy, dark gray look was a big step for WinBook, but we think the company

did a good job of designing its new models. The J1, for example, has the same basic shape and proportions, but has much smoother, more rounded corners and a two-tone color scheme that gives it a much lighter appearance. The lid panel is made from a tough magnesium alloy and seems equal to the task of protecting the LCD (liquid-crystal display) screen. We were a bit surprised at how much we could move the edges of the inner

lid panel around the display, but everything else seemed solid, and we liked the silver accents of the speaker grilles and control panel above the keyboard.

The active-matrix display is a good one and the speakers complement it nicely. The keyboard that sprawls across the base of the unit felt a bit shallow, and because of the cursor control keys along its right edge, it seemed somewhat cramped on that side, but was otherwise very agreeable. We weren't as happy with the J1's touchpad, however. It provided dodgy, erratic control at virtually every speed setting from slowest to fastest, which is very annoying if you do lots of pointing and clicking (rather than using keyboard navigation).

**Performance.** We were understandably excited at testing our first 1GHz notebook, but the J1 didn't provide the oohs and ahs we'd hoped for. It turned out SYSmark2000 scores of 122 in Office Productivity, 144 in Internet Content Creation, and 131 overall, which put it 13 overall points behind the slowest 850MHz notebooks we've tested. Its Video2000 marks were also rather dismal, as was its DVD movie playback, most likely due to its combination of a VIA Apollo motherboard chipset and its Trident video controller with shared video memory.

**Final word.** Although its performance scores were a bit of a letdown, it did considerably better than any other notebook we've ever tested in our \$1,000 to \$1,499 price category. In fact, its performance would hold up to comparison with notebooks that cost as much as \$1,000 more, and when you look at it like that the J1 is really a pretty good buy. It's not a great movie-watching machine, and some users will want to plug a mouse into one of the two USB (Universal Serial Bus) ports on its backside; otherwise we think you'll like this notebook. **[B]**

by Chris Trumble

## Features

**Processor:** 1GHz Pentium III

**RAM:** 128/256MB

**Display:** 13.3-inch TFT

**Dimensions (inches):** 14.2 x 12 x 9.53

**Weight (pounds):** 5.9

**Hard Drive:** 10GB

**Optical Drive:** 8X DVD-ROM

**Connectivity:** 56Kbps (kilobits per second) modem

**Final Word:** Its 1GHz processor falls victim to a suspect motherboard chipset and video control chipset, but it still manages to impress compared to units in its price range; the J1 is a nice, very affordable departure from traditional WinBook style.

notebook company was getting ready to spring on us not one, but two brand new units with drastically new looks and some pretty impressive features. On April 16, WinBook publicly unveiled its J1, a notebook that is remarkable enough in that it eschews the traditional WinBook look, but even more so for the fact that it offers a 1GHz (a billion clock cycles per second) processor and costs less than \$1,500.

## J1 1000

**\$1,499**

**WinBook**

**(800) 254-7806**

**(614) 850-3000**

<http://www.winbook.com>

## ThrustMaster NASCAR Charger 2



There are lots of choices when it comes to getting a steering wheel controller for your PC. ThrustMaster alone offers five different models, ranging in price from \$29.99 to \$129.95, so choosing one can be difficult. The \$39.99 NASCAR Charger 2 is one step up from the company's entry-level NASCAR Charger steering wheel and comes with pedals and a clamping mechanism to secure it to your desk.

The NASCAR Charger 2 plugs into your PC's game port and is relatively easy to install. Just plug it into the game port and install the software, a simple enough process. We were a little surprised to find that the driver CD that came with the unit didn't include the necessary software drivers. We had to download them at ThrustMaster's Web site, a task that would have been fairly tedious if we had used a dial-up connection (even with a 56Kbps [kilobits per second] modem). The file we needed was 4.36MB in size, and once we got it downloaded it took just moments to

install it to our test PC.

The NASCAR Charger 2's simple set of controls includes four configurable buttons on the spokes of the wheel itself, two shift paddles behind the wheel (one on each side, attached to the steering column), and a small console with two pedals. We clamped the wheel console firmly to our PC desk, put the pedal unit on the floor in front of a chair, and put the Charger 2 through its paces with the help of *Driver from GT Interactive*. The game casts you in the role of an undercover cop posing as an organized crime getaway driver, so there's plenty of high-speed chases through metropolitan areas to test your resolve (and your steering wheel). The NASCAR Charger 2 lived up to the challenge thanks to ThrustMaster's traditionally solid construction and responsive control.

Like most PC driving games, *Driver* gives you the option of shifting manually or driving

an automatic, so you can make use of the Charger 2's shift paddles, or not, as you see fit. The pedal unit isn't as heavy as some thanks to its mostly plastic construction, but it stayed firmly in place for the most part and the pedals are springy and responsive. The wheel and wheel console are largely made of plastic as well, but we didn't detect any signs of weakness as we screeched through the streets of Miami, San Francisco, and New York. The only things we really missed as we put the wheel through its paces were a gearshift lever and force feedback, but both features generally come on more expensive wheels. If you're looking for an inexpensive wheel for kids or occasional use, the NASCAR Charger 2 is a functional, affordable option to consider. **ES**

by Chris Trumble

### NASCAR Charger 2

\$39.99

ThrustMaster (a division of Guillemot)

(877) 484-5536

(415) 547-4050

<http://www.thrustmaster.com>

## ThrustMaster Top Gun Fox 2

If you've played many flight simulator games on a PC, you know there's no substitute for a joystick controller for precise control and a realistic feel. The problem is that unless you eat, sleep, and breathe flight sims, you probably don't want to spend your kid's college fund on a controller you'll use occasionally to play games with. That's where the Top Gun Fox 2 PC joystick comes in, offering decent in-flight control at a price that won't keep you grounded.

The Top Gun Fox 2's silver plastic body accented with black rubbery inserts features several configurable buttons and controls, including a trigger, three thumb buttons, and a slide throttle. The center thumb button is the Fox 2 button with a flip over mask that prevents users from unleashing the fury of

their weaponry inadvertently. The game port compatible stick is fairly easy to install, just plug it in and install the included ThrustMaster software. Like most non-USB (Universal Serial Bus) devices it requires a reboot, but this is a minor step. We had a little trouble configuring the throttle control at first, but with a little perseverance we got it taken care of.

We tested the Fox 2 with Microsoft's *Combat Flight Simulator*, a game that puts you in the cockpit of vintage World War II military planes. It performed well, although we did find ourselves missing the rotating stick z-axis rudder control the Fox 2

Pro comes with. Having rudder control tied into the stick is the next best thing to actually having rudder pedals, which usually cost more to purchase than the Fox 2 does. The

stick is responsive and just stiff enough, and the buttons are comfortable and easy to use.

The Top Gun Fox 2 is a nice entry-level joystick (it costs just \$19.99), but most of the time as we used it we found ourselves thinking how much better the Top Gun Fox 2 Pro is. For just another \$20 the Pro version offers a rotating handle rudder control, a thumb operated 8-way hat switch, and three more buttons to keep you from having to use your keyboard quite as much. If you're on a tight budget or are looking for a simple controller for younger gamers the Fox 2 is great, but if you really want to get into flight sims we'd recommend springing for the extra \$20 and moving up to the Fox 2 Pro. **ES**

by Chris Trumble

### Top Gun Fox 2

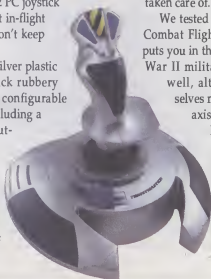
\$19.99

ThrustMaster (a division of Guillemot)

(877) 484-5536

(415) 547-4050

<http://www.thrustmaster.com>



# Pentium 4

## A Look At Intel's (Net) Bursting Processing Power

If you're like most people, you're probably wondering one thing about Intel's Pentium 4 microprocessor: Why is the company using bald-headed, blue-skinned men in its P4 ads? And why are those men playing golf, running on treadmills, and catapulting light bulbs? The ads are funny, but why is Intel using them?

Whatever the reason for Intel's use of the Blue Man Group (a creative artistic group) in its PIII and P4 television ad campaigns, one thing is certain: The widespread knowledge and use of the Pentium brand name has never been stronger. Intel doesn't even show or mention a computer or a microprocessor in the P4 commercials, yet most viewers know exactly which product the commercial is touting.

Whether it's the antics of the Blue Man Group, the strong brand-name recognition for Pentium and Intel, or the excitement of industry analysts, P4 has received plenty of attention in its first six months of existence. We'll break down the inner-workings of the P4 and help you decide whether it actually will live up to the hype.

**Microprocessor Basics.** Most microprocessors contain similar components and follow similar procedures for performing tasks. We will discuss some of the basics of microprocessors before delving into the specifics of the P4.

### The PC's brain.

The microprocessor, sometimes referred to as a CPU, is the key to all data transfers and processing within the computer. The computer's peripheral components send all instructions and data requests through the microprocessor for processing before traveling to the appropriate destination. Because of its ultimate control over all of the computer's processes, you'll often hear the microprocessor called the "brain" of the computer.

Microprocessors perform all processes in binary language. Binary is a base-two math system where a 0 or 1 represents all digits. In reality, the microprocessor reads electronic pulses as off or on to represent the binary language.

**Transistors.** All microprocessors use transistors. Bell Labs invented the transistor in 1947, and these tiny pieces of silicon cover the microprocessor. Intel's 4004 microprocessor, released in 1971, contained 2,300 transistors. Thirty years later, the P4 microprocessor contains 42 million transistors.

The transistors pass or block the electronic pulses in the microprocessor, representing the binary on and off required for processing data.

**CPU in action.** Here is a simplistic look at how a microprocessor processes data.

Intel introduced its P4 microprocessor, shown here, late in 2000. The P4 features new micro-architecture, called NetBurst.



When you press a

key on your computer keyboard, a series of events happens as the keyboard passes that data to the microprocessor. First, the microprocessor's decode unit must decode the character represented by the key into binary. The electronic pulses that represent the key then travel through the wires, transistors, and circuits that make up the microprocessor. The microprocessor eventually passes the data on to your computer's video card and monitor, and the key you pressed appears as a character on your monitor's screen.

While the processing of the data is extremely complex, it all takes place so quickly that it seems instantaneous to you. Depending on the type of software you're using, several other steps could happen as the microprocessor processes the data, all in a fraction of a second.

Microprocessors have steadily evolved since their inception, improving in processing capabilities and speed. The P4 is just the latest product in the ever-evolving microprocessor architecture, as manufacturers squeeze more and more transistors onto the chip.

**Pentium 4's History.** Intel code-named the P4 chip Willamette and released it late in 2000. It is the successor to the PIII, which several computer systems continue to offer at clock speeds around 1GHz. The top clock speed PIII should be able to offer, because of its architecture, is 1.3GHz. Clock speed measures the number of cycles a microprocessor executes per second; 1GHz is equal to 1 billion cycles. Clock speed is one of the main determinants in how fast a system processes data.

The P4's clock speeds range initially from 1.3GHz to 1.7GHz, although much faster speeds will be possible. The 1.7GHz P4 chip debuted in April 2001, while a 2GHz P4 chip should debut in time for use in PCs before the 2001 holiday season.



### Pentium 4 Specifications

- 1.3GHz to 1.7GHz clock speeds
- 42 million transistors
- 217 square millimeter size
- Uses Intel D850GB motherboard and 850 chipset
- 8KB data Level 1 cache
- 12KB Execution Trace Level 1 cache
- 256KB Level 2 cache
- 400MHz system bus
- 3.2GB transfer speed between chip and RDRAM
- Uses 55 watts of power (at 1.5GHz clock speed)
- Based on 0.18-micron manufacturing process
- \$300 to \$700 cost per P4 chip



The P4's design makes it specifically able to handle 3-D graphics, either in gaming software, in multimedia-intensive applications, or through the Internet. (See the "Optimized For Pentium 4" sidebar for information on software optimized to use the P4.) Intel envisions heavy audio and video streaming as key applications in the near future on the Internet, and the P4 will work well with those technologies. The initial release of P4 offers speed improvements over the top-of-the-line PIII chips of about 20% to 30% in audio applications and 40% to 50% in video applications.

Intel is hoping to sell more P4 chips than PIII chips by the end of 2001 or early in 2002, but two things may hold back mainstream use of the P4, at least initially.

First, its larger die size of 217 square millimeters (more than double that of the PIII) makes the P4 more expensive to produce. However, Intel expects the size of the chip to shrink once the company switches from the 0.18-micron manufacturing process to the

0.13-micron manufacturing process.) The die size is surface area on which construction of the microprocessor takes place. Construction of each microprocessor occurs on a silicon wafer, on which the manufacturer builds several microprocessors at one time.

Second, Intel specifically designed the P4 to use RDRAM (Rambus dynamic RAM), which is a type of memory that is more expensive and rare than SDRAM. Both of these factors will make P4 computers more expensive to produce.

However, Intel already has discounted prices on the earliest versions of the P4, which is helping P4 computers approach a \$1,200 price point. For example, the 1.5GHz P4 was selling for approximately \$500 at the beginning of April, and when we went to press a month later, consumers could buy a 1.7GHz P4 for \$380. In addition to making the chip more accessible to users in the mainstream by lowering prices, Intel is likely hoping to fully establish the P4 before the arrival of AMD's coming

rival, which we look at in a coming issue. Intel also has announced plans to create a new P4 chipset that will work with forms of SDRAM. (See the "Chipsets & Memory" sidebar for more information.)

■ **The NetBurst Core.** The P4 offers the first new micro-architecture in the Pentium family of chips since October 1995, when the Pentium Pro debuted the P6 micro-architecture. The P6 micro-architecture appeared in every Pentium chip that preceded the P4, including the Pentium Pro, Pentium II, and PIII, as well as the Celeron and Xeon processors.

Intel calls the new micro-architecture in the P4 Intel NetBurst micro-architecture, or NetBurst for short. Under the P6 architecture, Pentium chips were beginning to reach the ceiling for clock speeds, so by developing its new NetBurst micro-architecture for consumer-based PCs, Intel is able to significantly increase clock speeds for its mass-produced processors. With the development of NetBurst, Intel is

## Optimized For Pentium 4

**M**any of the software titles and technology advancements designed to take advantage of the P4 chip feature 3-D graphics. To find PC vendors offering PCs with P4 chips, visit <http://www.intel.com/home/buyers-guide/vendor-find.htm?computers=7&x=20&y=8> at the Intel Web site.

Listed here are software titles and Web sites that their developers have optimized to take advantage of the P4's features.

### 3DFilm 2000 RadTIME

Users can create animated graphics and special effects on the PC, and the software speeds the rendering process.

<http://www.radtime.com/prod01.htm>

### Aquarius

**Jack in the Box Computing**  
In this gaming software, humans have colonized a planet in another solar system, but they

must battle another race of beings to survive.

<http://www.jackbox.com/aquarius/index.html>

### Arthur's Knights Cryo Interactive

This adventure gaming software sends users back to the time of Excalibur.

[http://arthur.cryogame.com/ang/navigation/home/frameset\\_home.htm](http://arthur.cryogame.com/ang/navigation/home/frameset_home.htm)

### C-me Browwear

Internet clothing shoppers never have to guess at how a piece of clothing will look on their bodies again! C-Me will create a 3-D image of your body.

<http://www.browwear.com>

### Clean! plus 2.0 Steinberg

This software package takes advantage of the Pentium 4's powerful processing capabilities to create clear audio tracks

when burning CDs.

<http://www.steinberg.net/products/ct/pc/cleanplus>

### CorelDRAW Graphics Suite 10 Corel

Users gain access to several powerful graphics-editing tools through this package, including vector illustration, bitmap creation, and animation software.

<http://www.corel.com>

### Cult3D Cycore

Cult3D technology lets users create interactive 3-D images to share across the Internet.

**The 3-D graphics in  
Giants: Citizen Kabuto  
from Interplay take  
full advantage of the  
capabilities of the P4.**

<http://www.cult3d.com>

### English Onespace Enfish

Users of English Onespace can better integrate information they download from the Internet with information stored on their desktop computers, enhancing overall productivity.

<http://www.enfish.com/products/index.asp>

### Giants: Citizen Kabuto Interplay

In this strategy game, you can





focusing on applications and technologies that require improved media performance.

While some people may refer to NetBurst as P7, that isn't quite accurate. The P7 micro-architecture will probably debut with the 64-bit Itanium processor. Current Pentium processors are 32-bit processors. Itanium processors for high-end servers should be available in the second half of 2001, but Intel has previously delayed the release of the Itanium several times. Intel already has a successor to the Itanium, code-named McKinley, in the works. McKinley might appear in 2002.

■ **P4's Pipeline.** Users will find one of the largest differences between the PIII and P4 within the P4's NetBurst pipeline. You can think of the pipeline in a processor as an assembly line in a factory. At each station on the assembly line, a worker performs a task designed to enhance the final product. If the final product requires 100 steps to complete, and the assembly line has 100 stations with 100

employees, the product will move smoothly and quickly through the manufacturing process because each employee can focus on one simple step. However, if the assembly line has only 25 stations with 25 employees, each employee must perform four tasks, which might cause a backup on the assembly line and slow production of the final product.

The pipeline in the processor moves data in much the same way as the assembly line. Each station on the assembly line is equal to a stage in the processor. Processors with more pipeline stages can move data more quickly through the CPU. For instance, in the branch prediction pipeline, the P4 contains 20 stages, which is 67% more than the 12 stages contained in the PIII chip. Intel calls the P4's longer pipeline Hyper Pipelined Technology. (Intel often refers to the longer pipeline as a deeper pipeline.)

**Prediction is key.** The longer pipeline found in the P4 is one reason why it can offer such high clock speeds. Chips with longer

pipelines can move instructions and data through to the processor more quickly than can chips with shorter pipelines. However, longer pipelines aren't always a perfect solution. Within the longer pipelines, the processor's ability to predict branch decisions becomes extremely important to the overall speed.

For example, when you're using a program, and a dialog box with two or more choices pops up on the screen, the P4 uses branch-prediction algorithms to guess which selection the user will make. It then loads the instructions for that selection while waiting for you to click one of the choices.

If you click the choice the processor expected, it can quickly process the loaded instructions. However, if you click an unexpected choice, causing a branch misprediction, the P4 must remove the instructions it had loaded, load the new instructions, and then process them. Branch mispredictions that occur in a longer pipeline take longer to remove than in a shorter pipeline. While this sequence happens

select which of the three races you want to use in attempting to survive on a lush asteroid.

<http://www.interplay.com/giants>

#### Incoming Forces Rage Software

You'll be the head of an alien defense force in this gaming software, which is the sequel to Incoming.

<http://www.rage.co.uk/flash/gamers.html>

#### iVideo Be Here

Using some of the iVideo products from Be Here, users can combine 360-degree panoramic images with Internet video streaming.

<http://www.behere.com>

#### Madden NFL 2001 EA Sports

The amazing reality of graphics and movement of characters in sports gaming software continues to show impressive

improvements in this popular football game.

<http://madden2001.ea.com/main.html>

#### MotionPerfect Dynapel Systems

For those who want to enhance the performance of video clips sent across the Internet, MotionPerfect can deliver by synthesizing dropped frames.

<http://www.motionperfect.com>

#### Operation Flashpoint Bohemia Interactive

This war game is set in 1985 in the former Soviet Union and features realistic equipment from the Cold War era.

<http://www.flashpoint1985.com>

#### Print Shop 11 The Learning Company

In the latest version of this graphic-design software package, developers have further integrated Web publishing

features with traditional print publishing and project features.

<http://www.learningco.com/SubCategory.asp?CID=117>

#### Pulse 3D Player Pulse Entertainment

This free plug-in for your Web browser gives you access to 3-D images on the Web.

<http://www.pulse3d.com/index.asp>

#### Sacrifice Shiny Entertainment

Use your wizard to control powerful armies and spells in your battle with four other wizards, controlled either by the computer or by another player in this gaming software, which makes strong use of SSE2 technology.

<http://www.sacrifice.net>

#### Star Trek Voyager: Elite Force

Raven Software  
Star Trek Voyager fans can assume the roles of their favorite

characters in this game.

<http://www.ravensoft.com/ellitforce>

#### Tribes 2 Sierra Studios

The multiplayer capabilities of the gaming software Tribes 2 help place an emphasis on teamwork.

<http://www.sierrastudios.com/games/tribes2>

#### VideoWave 4 MGI

You can create several different types of videos with a variety of special effects and editing tools using VideoWave 4.

<http://www.mgi.com/vldeo/wideowave4/Index.asp>

#### Virtual Pool 3 Interplay

The graphics available through the latest version of this pool and billiards simulator are amazing.

<http://www.interplay.com/vp3>

very quickly, the processor still can't match the speed that occurs when the branch-prediction algorithms work correctly.

You probably can relate to this process through your employment. If your boss asks you to meet with her and provide supporting details for a purchasing request, you'll probably gather as many reports as you can in an effort to have the data to back up your answers to her questions. If you anticipate her questions correctly and have the right data available, you'll look like an organized genius, and your meeting will be short. But if you guess incorrectly and have to fumble for the right answers, you'll look unorganized and will spend far more time in her office than you want.

**Improved branch-prediction algorithms.** Developers design branch-prediction algorithms to help keep such branch mispredictions to a minimum, and Intel has emphasized improvement of the branch-prediction algorithms in NetBurst through the Execution Trace Cache (which we discuss

## The Intel® Pentium® 4 Processor Takes A Leap Forward, Delivering...



This slide from Intel shows the major elements of the P4's NetBurst micro-architecture.

later). In gaming and multimedia software applications, where user actions typically follow a pattern in response to the software, the branch-prediction algorithms tend to perform well in benchmark tests. However, in business software applications, where user requests can be wide-ranging, the branch-prediction algorithms tend to make more mistakes, causing slower benchmark tests.

Because the P4 especially tries to improve the performance of graphics-intensive

software, though, Intel seems willing to sacrifice some performance improvements for business software. Because business software rarely taxes the capabilities of today's microprocessors, some branch mispredictions that limit performance enhancements probably won't be noticeable, either.

■ **Inside The P4.** The P4 chip contains 42 million transistors, which is nearly 50% more than the PIII chip has. The overall architecture of the P4 will yield much faster clock speeds than have been

available in any other mass-produced, consumer-based CPU. Estimates for the high-end of the P4's clock speed are anywhere from 3GHz to 10GHz. Here are some of the features of the P4.

**Intel Hub Architecture.** A major improvement in the P4 architecture is in the Intel Hub Architecture. With its 850 chipset, the P4's system bus offers a speed of about 400MHz, which is about three times as fast as the PIII system bus. With a much faster

## Terms To Know

**ALUs (arithmetic logic units)**—The parts of the microprocessor that perform integer math functions; the two ALUs in the P4 operate at double-clock speeds.

**branch misprediction**—An error by the branch-prediction algorithms in which the microprocessor must flush the entire pipeline before new instructions can be loaded.

**branch-prediction algorithm**—Educated guesses made by the microprocessor in an attempt to predict selection from the user. Instructions relevant to those predictions are loaded into the pipeline while the microprocessor waits for the user to make a selection.

**DDR SDRAM (double-data-rate synchronous dynamic RAM)**—Sometimes shortened to DDR, it's a high-speed DRAM alternative to RDIMM; Intel expects to offer P4 chipsets that can use DDR within a year.

**DRAM (dynamic RAM)**—A form of RAM commonly found among consumer-based PCs. DRAM is available in many types.

**ICH2**—Short for the 82801BA I/O Controller Hub, which is part of the Intel 850 chipset. It helps give peripheral devices fast access to the microprocessor.

**Intel 850 chipset**—The set of chip hubs and buses designed specifically to work with the

P4 microprocessor.

**MCH**—Short for the 82850 Memory Controller Hub, which is part of the Intel 850 chipset. It connects the DRAM and the graphics controller with the microprocessor.

**Micron manufacturing process**—A number that refers to the size of certain features on the chip. Intel is in the process of switching from a 0.18-micron to a 0.13-micron manufacturing process, which will allow it to make smaller chips and boost microprocessor performance.

**NetBurst**—The new Intel microprocessor core architecture, available for the first time

with the P4. NetBurst should provide a much higher ceiling for clock speed limitations than the P6 core did.

**RDIMM (Rambus DRAM)**—The type of high-speed DRAM from Rambus for which the P4 is optimized.

**SDRAM (synchronous DRAM)**—A cheaper, more plentiful, and slower type of DRAM than RDIMM; Intel expects to offer P4 chipsets that can use SDRAM within a year.

**SIMD (Single Instruction Multiple Data)**—A technology that helps reduce the number of instructions a program requires to execute.

bus, the P4 can process data much more quickly. The P4 also features the Execution Trace Cache, which stores decoded instructions to prevent data bottlenecks in the system bus.

**Double-clocked ALUs.** Within the P4 is a high-powered ALU (arithmetic logic unit), where calculations of integer math take place. In the P4, the ALU runs at a clock speed twice as fast as the overall processor (called double-clocking or Rapid Execution Engine), meaning the CPU should rarely, if ever, need to wait for the ALU to complete calculations, which would slow the overall processor speed. The double-clocking ALUs also minimize idle time for the processor. While PIII chips used three ALUs, P4 will use only two ALUs. Thanks to the increased clock speed of the P4 ALUs, though, the overall processing speed of the ALUs will increase.

**L1 and L2 cache.** Intel has improved the L1 (level 1) and L2 (level 2) cache areas with the P4, too. In addition to the typical L1 data cache found in many processors, the P4 features an Execution Trace Cache, in which instructions and data can be stored in decoded format. With some data already decoded, the P4 can work with data in the L1 cache more quickly and minimize the occurrences and effects of branch mispredictions. This process also makes better use of the L1 cache storage area, maximizing the number of times data stored in the cache is actually used.

The P4's L2 cache, called the Advanced Transfer Cache, now has a higher data channel, letting it transfer data about 150% more quickly than the PIII processor's L2 cache. The L2 cache also monitors the patterns of data and obtains relevant data to store in the cache in hopes of speeding overall data retrieval and processing.

**SSE2.** Finally, the P4 offers SSE2 (Streaming SIMD Extensions 2), which is a set of 144 instructions designed to improve the performance of various multimedia and graphics applications, such as voice recognition and video streaming. The SSE2 is another feature that focuses on making the P4 work well with graphics-intensive applications. However, software designers will need to build SSE2 enhancements into their software packages to enable this feature.

As you can see, the P4's overall architecture focuses heavily on making sure the processor rarely has to wait for data to arrive. A larger

## Chipsets & Memory

The P4 features a new chipset, the Intel 850, and improved memory usage. Here's a detailed look at some of these innovations.

**Chipsets.** The P4's Intel 850 chipset, called Intel Hub Architecture, helps drive the high-end speeds of which the P4 is capable. Two hubs aid the P4 with its processing work.

The 82850 MCH (Memory Controller Hub) connects to the RDRAM (Rambus dynamic RAM) with dual memory channels. Through the MCH and the P4's 400MHz system bus, bandwidth capabilities are typically about three times as large as were available with the PIII. The MCH also provides the latest graphics support through AGP4X technology, which gives graphics

access the processor. The ICH2 manages dedicated data paths from graphics and memory areas to achieve greater bandwidth capabilities. The ICH2 manages two USB (Universal Serial Bus) controllers over four ports, providing 24Mbps bandwidth. Improved architecture with the ICH2 improves the data transfer speed for other accessories, such as the hard drive, network connection, and modem connection.

**Memory.** With dual RDRAM memory channels, the P4 can provide up to 3.2GB bandwidth speeds. While the high bandwidth is desirable, the problem with RDRAM is its current high price and scarcity. Also, systems will need certain configurations of RDRAM to properly take advantage of

begin offering P4 chipsets, code-named Brookdale, that can support other types of memory, such as SDRAM (synchronous dynamic RAM) and the high-speed DDR SDRAM (double-data-rate SDRAM) in the second half of 2001. SDRAM is much less expensive than RDRAM, and DDR SDRAM should come down in price quickly, according to analysts.

Either type of SDRAM, however, won't take full advantage of all of the P4's processing capabilities, according to Intel. The streaming media capabilities of the P4 will suffer the most when using the chip with SDRAM. DDR SDRAM, often shortened to DDR, may be a less expensive alternative to RDRAM. Several memory manufacturers, led by Micron Technologies, have pledged strong support for DDR and hope to bring its price point down quickly.

No one knows whether prices for all types of DRAM actually will drop, though. Rambus, which owns patents crucial to production of RDRAM, SDRAM, and DDR, has sued several DRAM manufacturers, demanding royalties. If Rambus wins, the overall cost of all types of memory is sure to rise.

Despite plans to offer the SDRAM chipsets, Intel maintains RDRAM is the best choice for P4 systems. Intel hopes mainstream usage of P4 chips will spur increased production of RDRAM, bringing down prices. □



The MCH and ICH2 controllers, shown here, are part of the Intel 850 chipset.

controllers access to the main memory at speeds of better than 1GBps (gigabyte per second).

The 82801BA I/O (input/output) Controller Hub, or ICH2, adds to the improved bandwidth and improves the speed with which peripheral devices can

the P4 architecture.

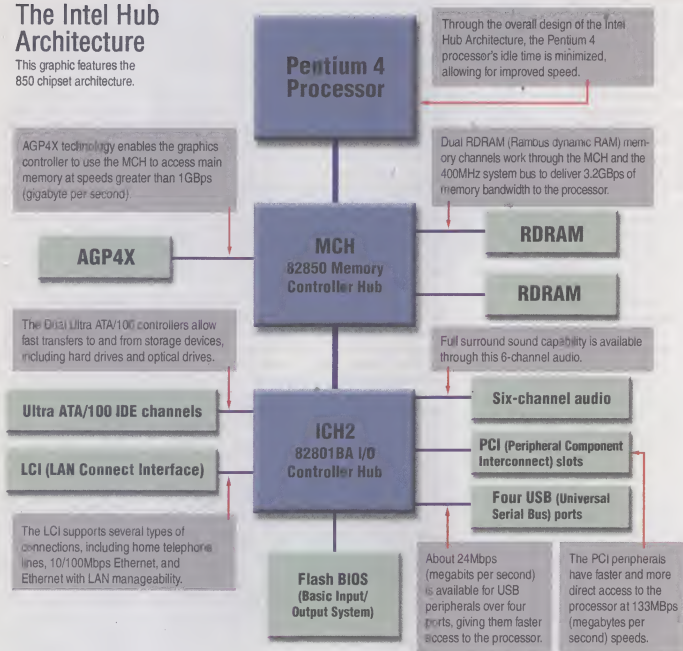
Rambus, with the backing of Intel, developed the high-speed memory technology used in RDRAM. Rambus doesn't actually make RDRAM; it leases the technology to memory manufacturing companies. However, it's expected that Intel will

system bus, double-clocked ALUs, and other improvements in moving instructions within the CPU and through the chipset yield a lot of the power for the P4.

■ **P4's Future.** We mentioned the Pentium Pro earlier, and it's possible this initial P4 chip offering could have a short shelf life, just as the Pentium Pro did. Intel continues to

## The Intel Hub Architecture

This graphic features the 850 chipset architecture.



work on a new P4 design, and the company should release the new version late in 2001. This new version of the P4, which is code-named Northwood, will probably use the 0.13-micron Intel architecture, rather than the 0.18-micron Intel architecture the initial release of the P4 features.

At the time of this writing, Intel has only publicly revealed that Northwood is a code name for a 0.13-micron member of the P4 family, and the company should complete its transition to manufacturing 0.13-micron chips late in 2001. Intel says the initial version of the P4 is

different from the Pentium Pro because Intel aimed the Pentium Pro at business and high-end users, while the initial version of the P4 is available in both consumer- and business-oriented PCs.

Some reviewers and benchmark testers have been less than enthused with the overall performance of the P4, even labeling it "quirky." Some analysts think the P4 won't reach its full potential until its clock speed surpasses 2GHz, which will allow the chip to fully take advantage of its 400MHz system bus.

The one thing the reviewers have agreed upon: The P4 will be great for intensive graphics applications, especially those involving 3-D graphics, but note the emphasis on "will be." The new 0.13-micron architecture in the Northwood chip should begin to fully deliver on the promise of the P4, removing all quirkiness from the process. You can expect the quirkiness of the Blue Man Group to remain prominent, though. [E]

by Kyle Schurman

# Tips To Improve Your PC's Performance

**M**ost computer users expect their PC to work exactly the way it did when they first bought the system. Many may never run into a problem with their PC the entire time they own it, although the likelihood of that happening is slim. Often times problems will arise, or you might decide you want a little more from your system. Throughout this next section, we look at various software tips that will help you improve your PC's performance.

You will find various instructions to help you improve the way your operating system (Windows 98, Me, NT, 2000) runs. In addition, we help you explore how to keep different parts of your PC running in top condition, such as your hard drives, memory, video cards, and monitors; the startup process; and how adjustments to each can improve how your computer operates.

Keep in mind, though, that you'll need to proceed with caution when using some of these tips, especially when it comes to making adjustments to your Registry or overclocking your system. One wrong setting and you could put your PC out of commission. If you are unsure of your ability to tweak some of these things successfully, then don't. If you feel compelled to try, then be sure to back up your system so you have something to revert to if your tweaking session fails.

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# TIPS

# Windows 98/Me

## Advice To Help You Safely Edit Your Registry

**O**f all the areas within your computer system, there is none more precious, in our opinion, than the one containing the data to construct and operate the system itself. Tweak it properly and you can customize your Windows OS (operating system) or resolve troublesome error messages and other operating problems. Mess this data up, and you can prevent your system from starting at all, necessitating a reinstallation.

Several files make up the total information base (some are holdovers from older versions of Windows), but there is one that towers above the rest, and its proper operation is critical to your system—the Windows System Registry (commonly known as the Registry). This is the Big Daddy of system information—literally, the blueprint that tells Windows how your system is supposed to operate, appear, perform, and so on.

The Registry can become damaged over time through innocent means, such as through the improper removal of programs or devices, without removing drivers and associated files or their mention in the Registry. When this happens, cryptic error messages and system freezes may start occurring, but the system can still operate fairly normally.

Users can even tamper with the Registry directly (as long as they don't tamper with the wrong files), corrupting it enough to affect performance, but not enough to bring it to a standstill.

However, if serious corruption occurs, either due to a user, a virus, or a poorly constructed device (and/or driver), the Registry can reach a point of no return, and Windows will not run. To reduce the chances of this happening, the technicians who created Windows built Registry-checking and repair tools into the OS.

Each time the system is started, a tool called Registry Checker evaluates the Registry for problems and fixes them if necessary and if possible. It then makes a backup copy of this functional Registry (along with copies of two

other system information files, Win.ini and System.ini). If the backup is created successfully, the complete set is compressed and saved as a CAB (cabinet) file and stored in a folder named Sysbackup.

Registry Checker keeps several (usually four or five) of these backups around. If problems are detected in successive startups, such as changes to the Registry that are not reflected in the system, Windows pulls one of these backups and replaces the corrupt Registry with a working one.

If this occurs, you lose any system modifications made since the last backup, but you don't lose your entire database of system settings or your data files. Which is why it is a good idea to restart your system after every change.

Because a properly structured Registry is so crucial to system operation, our tips will focus mainly on making Registry edits and enhancements. In case you simply can't bring yourself to touch that precious database, we will also offer some performance enhancers where the Registry changes will be made by Windows, not you. (If you think you may have problems with your Registry, refer to the troubleshooting tips in the "Spotting Trouble" sidebar).

Before we delve into what you can do to modify the Registry, however, we think it's important that you know a little more about what the Registry is and does, and even more significantly, what you can do to protect it.

### Registration, Please

Since the release of Windows 95, the Windows OS has incorporated the Registry, which is a database that stores information used to configure the system for its software, hardware, and users. Registry information ranges from user profiles to the document types that can be created by each program and includes such basic system information as settings for folders and program icons, ports in use, and more.

You can edit the Registry using the Registry Editor (regedit.exe) that Microsoft provides with Windows. Editing the Registry is not hard. It is similar to making changes to files in Windows Explorer. It is also perfectly safe, if you are careful to follow directions and not disturb unrelated portions of the Registry.

As we mentioned earlier, using Registry Editor incorrectly can cause serious problems that may require you to reinstall the entire OS. To make matters more ominous, changes made to the Registry occur on-the-fly, so there is no Save and no Undo. (This may not seem like an issue now. Wait until you get a phone call in the middle of an editing session, go off to take the call, and forget where you were, resulting in an incomplete edit that messes up your Registry.)

**■ Create A Backup Plan.** The cardinal rule in editing your Windows Registry is the same as for performing any system alteration—always make a backup. You can instruct Registry Checker to make a backup at any time, not just at system startup. If you are making a series of edits, you may wish to back up the Registry and restart the computer after each edit. This will ensure that a late alteration doesn't cause you to lose work performed at the beginning of the process. It's so easy that you may find yourself doing it every time you make any system alterations, which is a very good idea.

If you are a Windows Me user, you'll notice it offers an additional tool, called System



Restore, that maintains an ongoing snapshot of the Registry and a number of other system resources. If you are running WinMe, you may also wish to create one of these snapshots (called a Restore Point), which you can restore in the event of system failure. System Restore runs from System Tools, which is located on the Start menu under Programs, Accessories.

Follow these steps to back up the System Registry:

1. From the Start menu, click Run, type scanregw, and click OK.
2. When you are prompted to back up the Registry, choose Yes.
3. Click OK when you see the Backup Complete message.
4. Return to the Start menu, click Run, type regedit, and click OK.

This routine will cause Windows to back up the system information files to a cabinet file in the same manner it does at startup. If Registry Checker finds Registry errors at the next restart, it will locate this backup file and should be able to restore your system to the point just before you began your edits.

■ **Restoring The Registry Manually.** In the event that Windows doesn't restart normally after you perform Registry edits, you may be able to restore the Registry manually. (This is a good troubleshooting routine for any time your system will not start properly.)

For those WinMe users, you will need the Startup Disk to restore the Registry manually. Before making Registry edits, locate that disk. If you cannot find it, create one in the Control Panel. Click on the Add/Remove Programs icon, click on the Startup Disk tab and click Create Disk. You will be prompted to insert a diskette to create a Startup Disk.

1. If you are running Windows 98: Start your computer, then press and hold the CTRL key. Then choose option 6, Safe Mode Command Prompt Only, from the Startup menu.

If you are running Windows Me, start your computer with the startup disk.

2. At the MS-DOS prompt, type `cd\windows` \command and press the ENTER key. This will change the directory to the Windows\Command directory.

(NOTE: This command assumes Windows is installed in a folder called Windows. If you

is easier than using standard methods, and a few where it is the only option.

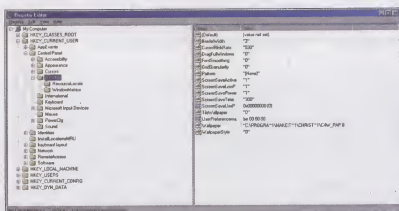
After the fact, though, you may decide you don't like a change and want to undo it. As a precaution, follow the first four steps in the Optimize The Registry section below to save a

Registry snapshot. You can then rebuild the Registry using that snapshot if you later wish to restore your old system settings. You will lose all changes that occurred after the export.

When you open the Registry Editor (by choosing Run from the Start menu, typing regedit, and clicking OK), the Registry appears as a series of folders in the left pane, much like Windows Explorer. Windows refers to these folders as Keys. If you click a Key, items appear in the right pane. These items are called Values. The Values are where the actual data is stored; the Keys define its usage. Imagine Values as the books in a library and Keys as the file system that determines where the books are kept



When you open Registry Editor, you are presented with the main Keys (in the form of folders) for the entire Windows system.



Click any Key and its Values will appear in the pane on the right side of the screen.

installed it into a differently named folder, replace the word windows with the name of the folder in which Windows is installed.)

3. Next, type scanreg/restore and then press the ENTER key.
4. Locate the Registry with the date and file name that matches your backup, highlight it using the Up and Down arrow keys, and press Enter. (This should be the last entry and should already be highlighted by default.)
5. When you receive notification saying You Have Restored A Good Registry, press the ENTER key to restart your computer.

You can also use this method to restore earlier versions of your Registry if you decide to undo edits you make.

### Modify The Registry

Microsoft has created alternate (and safer) methods for making about 99% of the system enhancing modifications that can be achieved by editing the Registry. Even so, there are still several instances when making Registry edits

and what topics they relate to.

Before you begin editing, familiarize yourself with the process. Click the plus (+) key in front of a Key (folder). This expands the folder to show the lower levels. Click a Key and see the Values appear; there is generally at least one by default.

Now, right-click any Key. Several options appear on a menu—Expand (if available), New (to create a new Key or Value within this Key), Find (which looks for text strings), Delete (delete the Key), Rename (give the Key a new name), and Copy Key Name (copies the name to the Windows clipboard).

Next, right-click a Value. Three options, Modify, Delete, and Rename, appear (if it is a Default Key, Rename will be dimmed). Modify lets you change the name or data in the Value. Now, right-click an empty space in the same pane. The only menu option is New. Click New and you'll see four options appear to create a New Key, String Value, Binary Value, or DWORD Value. (Don't worry about the types of Values. Any instructions for editing the Registry will tell you which Value to choose.)

As you continue through the steps in this article, keep in mind that all of our instructions assume you have opened the Registry Editor and are looking at the basic (main) window. If we instruct you to expand a series of folders, each successive folder will be located in the one you expanded previously. At the end of each operation, you should exit the Registry Editor by choosing Exit from the Registry menu and then restart Windows. This instruction will be assumed.

■ **Optimize The Registry.** This operation optimizes your Registry for performance, rebuilding it, and eliminating unused space. It is also an excellent troubleshooting routine, and it can be used to re-create an old Registry if you make changes to your system you decide you don't like. Before making the edits, though, you

must export the Registry, which we have outlined in steps one through four below.

1. From the Registry menu in Registry Editor, select Export Registry File.
2. Click the Save In drop-down menu and choose Desktop.
3. In the File Name box, type a name you'll remember. (A good choice is the current date, such as June15.)
4. Click the button that says All and click Save. A copy of your Registry will be saved to a separate location.
5. From the Registry menu, select Import Registry File.
6. Click the Look In Dialog box and choose Desktop.
7. Click the file you exported. It should appear in the File name box. Click Open. Windows will then import the old Registry, optimizing

it at the same time, and notify you when the import is complete. Then click OK.

8. Restart your computer.

■ **Speed Up The Start Menu.** Some users gain a small performance benefit from speeding up their Start menu. Here's how:

1. Select Find from the Edit menu and type Desktop. Click Find Next.
2. A Value called Default with Data titled Desktop should appear in the right pane. The left column should be filled with numbered Keys, with one, 00021400-000-0000-0000000000046, that is expanded. (You see why we recommend using Find.)
3. Right-click the right pane and select New, then String Value.
4. Name the Value MenuShowDelay (this should appear as one word).

## Spotting Trouble

**C**orruption or damage of the Windows Registry and other system files causes more headaches for users than any other issue. Here are three solutions for common problems.

**Problem:** A surprising number of people never update their OS (operating system), even though Microsoft regularly releases updates. Some of these are important and fix bugs that could potentially pose a security threat or other serious issue.

**Solution:** If you are suffering from system irregularities, visit the Microsoft Windows Update Web site (<http://windowsupdate.microsoft.com>) for the latest fixes before you begin troubleshooting routines. You should also consider updating other programs on your computer regularly.

After you do that and attempt the routines here, query the Microsoft's Knowledge Base (<http://support.microsoft.com>) with the exact nature of the problem if it is not resolved. If the solution requires you to edit

the Registry, which it may, you will already be properly prepared with the tips found in the article that accompanies this sidebar.

**Problem:** If your system is acting erratically or freezing frequently, you may find relief by cleaning the System Registry. The Registry is especially suspected if you have recently uninstalled programs but not removed them from the Registry.

**Solution #1:** Windows 98 users should download and install the Registry cleaning utility, RegClean, to perform this operation. To download it, visit the Microsoft.com Download Center at <http://www.microsoft.com/downloads> and do a keyword search for RegClean. It is important for you to know that RegClean will remove unnecessary entries, but it will leave intact any Registry entries it does not understand or that might be correct.

1. Download RegClean.exe, making note of the folder to which you saved it.

2. Double-click the RegClean file and it will display a progress dialog box while it loads and scans the Registry. This could take as long as 30 minutes.
3. After the progress meters disappear, you will be prompted to allow the system to repair errors or exit the program (Cancel). Unless you are familiar with Registry troubleshooting, you should choose Fix The Errors.

**Solution #2:** Windows Me users should use the Windows Registry Checker tool (ScanReg).

1. To start the Windows Registry Checker tool, click Run from the Start menu.
2. Type `scanregw.exe` in the dialog box and then click OK. ScanReg will look for problems, repair them, and optimize the Registry if necessary.

**Problem:** You are receiving error messages that a certain file is missing or damaged.

**Solution:** There are two possibilities that may be causing this.

One is that it's no longer needed, but the Registry still has it listed. This should be resolved by the routine given above.

If the message continues, you may need the file, and it has become damaged or been deleted. You should locate and replace it.

1. If the missing file was named, write down the name. Select Find (in WinMe you'll select Search) from the Start menu, and click Find Files or Folders. Type the name of the file you are looking for and press Go (WinMe users will press Now). Make sure that the correct hard drive is selected in the Look in box.
2. After the file is displayed in the search results window, right-click the file name and choose Properties.
3. Write down the location of the file. This is the path where you will restore the file.

If it is nested inside a program file, it probably belongs to that program and you will need the installation CD to replace it.

5. Click the new Value and select Modify. Enter a Value between 1 and 10 (1 being fastest). You might want to start with 5.

■ **Back Up User Profiles.** This comes more under the heading of preventive modifications than performance enhancing, but if you ever have a problem while working with the Registry, you'll thank us. If you have enabled User Profiles, only the default profile and the current profile will be saved when you (or the computer) create a backup of the Registry. You'll need to back up your other profiles if you want to be able to restore them. You can also use this process to back up other portions of the Registry by selecting them instead.

1. In the left Registry window, expand the HKEY\_USERS Key.

2. Locate the name of the profile you want to back up.
3. From the Registry menu, choose Export Registry File and follow the instructions to export the file, noting where you store the file. You can then import it into the Registry at a later date if you lose it during a Registry restore. Refer to the Optimizing The Registry section of this article for specific instructions.

■ **Delete User Profiles.** If you (or someone before you) used the Win98 or WinMe User Profiles feature to create profiles you no longer need, you can free up valuable space on your hard drive by deleting them. You can disable All User Profiles (so that all users of the computer see the identical Desktop and application interfaces) through the Passwords option in

Control Panel, but to remove individual profiles, edit the Registry.

1. From the left Registry window, expand the HKEY\_LOCAL\_MACHINE Key.
2. Do the same for Software, Microsoft, Windows, CurrentVersion and ProfileList.
3. From within the ProfileList folder, right-click on the appropriate user's Key (folder) and choose Delete.
4. When you see the dialog box that asks, Are You Sure You Want To Delete This Key?, press Yes.

### ■ Prevent The "Shortcut to" Prefix From Being Added To New Shortcuts.

This is a minor modification, but it fixes one of our pet peeves—the unnecessary (we think) words that are added to every shortcut you create.

If the file has a Version tab, click it, and then look at Company Name. The problematic file belongs to a program made by this company. If it is not a Microsoft file, you will need to contact the company that created the file. If the file is not found, try the methods below. You may need to reinstall your system.

#### In Win98:

1. From the Start menu, choose Programs, Accessories, System Tools, and click System Information.
2. From the Tools menu, choose System File Checker.
3. Select Extract One File From Installation Disk and type the name of the file you wish to extract in the Specify The System File You Would Like To Restore box. Then press Start.
4. Insert the Windows installation CD and click Browse to the right of the Restore From box. Click the plus (+) key in front of the CD icon. Click the Win98 folder. Then click OK. If it is not a system file, use

the appropriate CD and attempt to locate it there.

5. If you have it, enter the file path you noted in Step 1 into the Save File In box. If you don't have it, Windows may provide it. Click OK and continue doing so until the process is complete. Restart the system.

If error messages do not name a specific file, if you cannot find the destination of the file (and Windows does not supply it), or if problems continue, open System File Checker but select the Scan For Altered Files option instead. If you cannot locate the file to restore on the Installation CD, it is not a Windows system file.

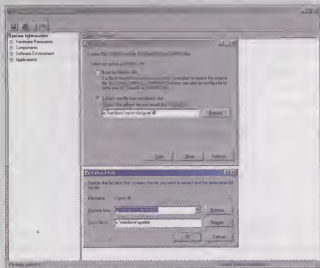
#### In WinMe:

1. Restart your computer and press the CTRL key after your computer completes the POST (Power On Self Test). When the Startup menu appears, select Safe Mode.
2. From the Start menu, choose Programs, Accessories, System Tools, and System Information.

3. From the Tools menu, click System Configuration Utility.
4. Next, click Extract File.
5. In the Extract One File From Installation Disk dialog box, type the name of the file to extract, and then press Start.
6. In the Restore From box, type c:\windows\options\install (or type c:\windows\options\cabs if WinMe came preinstalled on

your computer).

7. In the Save File In box, type c:\ and click OK to extract the file, then click Yes to create a folder for the extracted file.
8. Drag the extracted file from the folder on drive C: to the location of the file that you noted in Step 1, then click Yes to overwrite the file.
9. Finally, restart your PC. ☐



If you are receiving error messages in Windows 98 that a file is missing or has been damaged, you may be able to replace it using the Windows installation disc.



1. From the left Registry window, expand the HKEY\_CURRENT\_USER Key.
2. Do the same for Software, Microsoft, Windows, and CurrentVersion.
3. Click the Key (folder) entitled Explorer.
4. In the right window, right-click Link and select Modify.
5. At the point where the blinking cursor appears, type eight zeros, which will automatically be formatted like this: 00 00 00 00. Then click OK.

You can also remove the arrow that appears with shortcuts by editing the InkfKey file under HKEY\_CLASSES\_ROOT. Click the Key, right-click on IsShortcut in the window to the right, and select Delete.

■ **Non-Registry Tip.** You can eliminate the "Shortcut to" verbiage without editing the Registry, but it takes a little longer. To do so, create a shortcut by right-clicking any icon on your Desktop and selecting Create Shortcut. Right-click again, select Rename, and give it any name you like. Then, right-click and select Delete. Do this six times. On the sixth instance, the words will no longer appear.

■ **Move WinMe Installation Files.** If you have a partitioned drive, you can free up approximately 150MB of space by moving the WinMe installation files to another drive.

1. Open Windows Explorer (from the Start menu, select Run, type Explorer, and click OK) and expand drive C:. It may have a name with the C: in parenthesis after it.
2. Locate and expand the Windows folder, then the Options folder.
3. Right-click the Install folder and then choose Copy.
4. Navigate to the new drive, right-click it, and select Paste.
5. Next, open the Registry Editor (or click the window if it is open) and expand the HKEY\_LOCAL\_MACHINE Key in the left pane.
6. Do the same for Software, Microsoft, Windows, and CurrentVersion.
7. Click the Key (folder) entitled Setup.
8. In the right panel, right-click SourcePath and select Modify.
9. Change the location of the SourcePath value to the new location of the Install folder.

■ **Remove Programs From The Open With List.** This tip applies to WinMe (and Windows 2000) only. WinMe has an Open

With feature that lets you open a recognized file type by right-clicking it and selecting a program from the resulting list. This list is generated from every program with which you have attempted to open a file of that type, even if it did not succeed. If this behavior has caused inappropriate programs to be listed in your Open With box, you can delete them.

1. From the left-hand Registry window, expand the HKEY\_CURRENT\_USER Key.
2. Also expand Software, Microsoft, Windows, CurrentVersion, Explorer, and FileExts.
3. Under FileExts, you will see a laundry list of Keys (folders)—each of these represents an extension.
4. Expand the extension with the Open With List you wish to modify.
5. Click OpenWithList.
6. In the right window, right-click the Value with the program command (such as coreldrw.exe) that represents the program to be removed from the list and select Delete. Then click Yes.

■ **No Editing Required.** Here are some performance enhancers that don't require you to enter the hallowed halls of the Windows Registry. All Registry changes are made for you by the system.

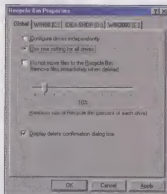
**Launch Startup Application Minimized.** If the applications that launch at Startup open in full-screen view, they are using up precious graphic resources and slowing down system launch. You can instruct Windows to open these programs in minimized mode.

1. Right-click the Start menu button and select Open.
2. Double-click Programs, then StartUp.
3. When the StartUp folder opens, right-click the shortcut of the program you want to open minimized and select Properties.
4. Click the Shortcut tab, and in the Run drop-down menu, select Minimized. Then click OK. The next time you start Windows, that application will open and then shrink to the Taskbar.

■ **Cut Down On Trash.** By default, Windows allocates up to 10% of your hard drive as a Recycle Bin receptacle. If you are low on disk

space or have a huge hard drive, 10% is too much and you should reduce it.

1. Right-click the Recycle Bin and then select Properties.
2. Change the Maximum size by moving the slider bar to the left.
3. If desired, you can check the Do Not Move Files To The Recycle Bin option, but this will mean that deleted files are removed immediately and permanently from your hard drive.



**Reducing the file allocation in the Recycle Bin is a great way to save hard drive space. Right-click the Recycle Bin and choose Properties to access this window.**

If you have multiple drives, you may want to select the option to configure them independently. This lets you create different sized Recycle Bins for each drive.

■ **Turn Off Windows Animation.** This tip, which disables the ability for windows to resize interactively as you drag them in or out, will squeeze a little speed out of Windows. (With this function disabled, windows will go straight to the final size you create.)

1. Right-click an empty place on your Desktop and choose Properties.
2. Click the Effects tab and uncheck the box that says Animate Windows, Menus And Lists.
3. Click Apply, then OK.

You've now been introduced to the Windows Registry and to the joys of making Registry edits, either directly or through Windows options. Once you have made a few successful edits, you may wish to explore further. Fortunately, there are thousands of users who have gone before you that are happy to share their favorite tips.

For more tips that don't involve direct editing, visit the Windows User Group Network at <http://www.wugnet.com>. For help with the Registry, try the Microsoft User Groups (find one at <http://msdn.microsoft.com/resources/usergroup/find.asp>). Experiment gradually and with caution and you can take your Windows OS to a level you never before thought possible. [E]

by Jennifer Farwell

# TIPS Windows NT/2000

## Tweaks To Keep Your System Running Smoothly

Even the best OSes (operating systems) leave room for improvement, and Windows NT and Windows 2000 are certainly no exception. In this section we've provided a wide range of tips to help you get the most out of both of these popular OSes. One word of caution though before we get started: always make sure you back up your system (or at least your Registry) before making changes to your OS. If you need to use the backup, you'll rest easy knowing that your data is safe no matter what.

Some of the tips outlined below will involve editing the Windows Registry. To do this we'll use Regedit, the built-in Windows Registry editor. To access the Registry, click Start, Run and then type regedit in the Open box. Press OK and the Regedit window will appear. Before making any changes to your Registry, always remember to back it up before editing.

### Internet Speed Tips

No matter how fast your Internet connection is, there always seem to be ways of tweaking it to get better throughput. In this section we've included some tips to help you maximize your connection's throughput.

**■ Cable Modem & DSL Speed Tip For Win2000.** Use this tip to boost your cable modem or DSL (Digital Subscriber Line) connection's throughput.

1. Open the Registry and find this key:  
a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\SERVICES\TCP\PARAMETERS
2. Create new DWORD values by clicking the Edit menu, New, select DWORD VALUE, and set (or add) the values listed below.  
a. DefaultHTL = 80 hex (or 128 decimal)  
b. EnablePMTUBHDetect = 0  
c. EnablePMTUDiscovery = 1  
d. SackOpts = 1  
e. Tcp1323Opts = 3

- f. TcpWindowSize = 5ae4c hex (or 372300 decimal)
  - g. TcpWindowSize = 5ae4c hex (or 372300 decimal)
  - h. GlobalMaxTcpWindowSize = 5ae4c hex (or 372300 decimal)
3. Exit the Registry and then restart Windows for your changes to take effect.

**■ Cable Modem & DSL Speed Tip For WinNT.** Use this tip to boot your cable modem or DSL connection's throughput.

1. Open the Registry and find this key:  
a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\SERVICES\TCP\PARAMETER
2. Create a new DWORD value by clicking the Edit menu, New, then select DWORD VALUE and set the values listed below.  
a. DefaultHTL = "80" hex (or 128 decimal)  
b. EnablePMTUBHDetect = "0"  
c. EnablePMTUDiscovery = "1"  
d. TcpWindowSize = "fafo" hex (or 64240 decimal)
3. Exit the Registry and then restart Windows for your changes to take effect.

### File System Optimization Tips

Keeping your computer's file system in pristine condition is one easy way to protect system performance. It's the same as cleaning your house or maintaining your car—if you take good care of your file system, your computer will reward you with a better performance.

**■ Configuring File Allocation Size (Win2000 & WinNT).** Optimize the

contiguous file allocation size for your file system with these changes. This will be a big help for disk intensive applications.

1. Open the Registry.
2. Find this key:  
a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\CONTROL\FILESYSYSTEM
3. Create a new DWORD value named ContigFileAllocSize
4. Set the value to equal 200 (hex) or 512 (decimal).
5. Close the Registry and restart your computer for your change to take effect.

**■ Increase The File System's Caching Memory (WinNT).** WinNT limits the amount of RAM that can be locked for I/O (input/output) needs. This tip lets you override the default setting.

1. Open the Registry and find this key:  
a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\CONTROL\SESSIONMANAGER\MEMORYMANAGEMENT
2. Create a new DWORD value named IoPageLockLimit (if it doesn't already exist).
3. Set the value to equal the maximum number of bytes to be allocated to I/O operations as per the table below:

RAM (MB)	IoPageLockLimit	
	Decimal	Hex
4	4096	1000
8	8192	2000
16	16384	4000
32	32768	8000
64	65536	10000

Use the Performance Monitor in WinNT to measure the effect of your changes and make adjustments accordingly.

■ **Increase NTFS Performance By Turning Off the Last Access Time Stamp (WinNT).** Each time WinNT accesses a directory on your NTFS (NT file system) drive it updates the time stamp on each directory. If you have a large number of directories, this can affect performance. You can improve this by turning off Last Access Time Stamp.

1. Open the Registry and find this key:
  - a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\CONTROL\FILESYSTEM
2. Create a new DWORD value by typing NtfsDisableLastAccessUpdate (or modify

the existing one) and set it to 1 to stop the LastAccess time stamp from being updated.

3. Restart Windows for the change to take effect.

■ **Disable 8.3 Name Creation Under NTFS (WinNT).** This change will stop your NTFS volume from creating MS-DOS compatible 8.3 file names. If your hard drive contains an NTFS partition with lots of long file names, this may increase performance.

1. Open the Registry and find this key:
  - a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\CONTROL\FILESYSTEM
2. Next, find the Value that is named NtfsDisable8dot3NameCreation
3. Change the Value Data from 1 to 0. (0 will disable, 1 will enable).
4. Close the Registry and restart Windows.

■ **Compress Files Or Folders In Win2000.** Another way to save space is to compress the contents of folders or files on your hard drive.

1. Right click the file or folder you want to compress.
2. Choose Properties on the pop-up menu.
3. Click the Advanced button.
4. Check the Compress Contents To Save Disk Space checkbox.
5. Finally, click the OK button to compress the file or folder.

■ **How To Check Your Hard Drive's DMA/UDMA Setting (Win2000).** DMA (direct memory access) and UDMA (ultra DMA) are systems that let devices on your computer transfer data into and out of RAM without having to go through your CPU. This can help

## Troubleshoot Common Windows 2000 Ailments

No matter what kind of PC you use, there are always certain problems that creep up when running Windows. Some of the most common problems include wasted RAM, clogged hard drives, and long forgotten programs still lurking on your hard drive. In this section we've compiled three tips that will help you avoid these problems and keep your system humming along smoothly.

**Problem:** Running out of memory.

**Solution:** Sometimes you may start a program and then forget that it's running, only to find that your PC's performance has decreased. Win2000 provides a very easy way to find the memory hogs that might be lurking in the background. Here is how:

1. Press CTRL-ALT-DELETE and open the Task Manager.
2. Click the Processes tab to see a list of applications and their memory and CPU usage.
3. If you notice one application that is sucking up gobs of memory and CPU time, you can close it to free up those resources.
4. Before closing the application in

Task Manager (where you can lose data if you abruptly close it down), first go to the application by pressing ALT-TAB and then save your data before closing it. This way you can close the memory hog but also preserve any work you've done in it.

**Problem:** Cluttered drives.

**Solution:** Another obvious but still very important way to protect system performance is to defragment your hard drive regularly. Fragmentation happens over time as you use and save files. As your drive becomes fragmented, it has to do more work to locate and access the files you want, thus taking longer for the system to find your files. To protect system performance use Win2000's Disk Defragmenter utility.

1. Click Start, select Programs, Accessories, and System Tools, and then click Disk Defragmenter.
2. When the utility starts a list of your hard drives and two buttons will appear—Analyze and Defragment.
3. Choose the drive you want to

defragment and then choose Analyze or Defragment. If you aren't sure if a drive needs defragmenting, choose Analyze and the utility will inspect the drive to see if it actually needs to be defragmented. It will show you a graphical display that will illustrate how bad the fragmentation is, and it will provide a report that you can print. If you opt to just click the Defragment button, you'll see a graphical display and the utility will begin defragmenting the drive immediately.

4. It's best to avoid running any other applications while the drive is being defragmented. Although the Win2000 defragmenter won't start and stop like the one in earlier versions of Windows, defragmenting ties up a lot of your system's capabilities. So it makes sense to leave your computer alone while it's defragmenting itself.

**Problem:** I have software that I don't use. How can I get rid of it?

**Solution:** Nothing is more annoying than running out of drive space, especially if your

drive is cluttered up with software you don't even use regularly. Win2000 has made it easy to get a handle on how often you're actually using a program.

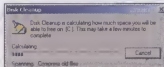
1. Begin by clicking Start, choosing Settings, and clicking Control Panel.
2. Click the Add/Remove Programs icon.
3. Click the name of the program you aren't sure you want to keep.
4. You'll see a list of details such as when the program was last used, how often you've used it, and the amount of disk space it's taking up.
5. You'll also see the Change and Remove buttons. Click the Remove button if you want to get rid of the program.

If you've installed a lot of programs, you'll be surprised when you try this. It's very easy to forget about all the programs that you rarely use. Remember that each of them eats up precious disk space. So cleaning house regularly can save you lots of disk space over time. □

improve your system's overall performance since it means that your CPU doesn't need to be involved, and your devices can respond faster. Generally speaking, most systems that can run Win2000 are set up to use DMA or UDMA.

The first time you install Win2000 it should enable DMA or UDMA. Unfortunately, sometimes this doesn't happen, so it's up to you to make sure they are enabled. Otherwise you may be missing out on a substantial performance boost from DMA or UDMA.

1. Right-click the My Computer icon on your Desktop and click Properties to open the System Properties menu.
2. Click the Hardware tab and then click the Device Manager button.
3. When the Device Manager list pops up, click the plus (+) key next to IDE ATA/ATAPI Controllers.
4. Right-click the Primary IDE Channel and select Properties from the pop-up menu.
5. Click the Advanced Settings tab and check to see if it shows DMA or Ultra DMA mode. If it does, you don't need to do anything else.
6. If it doesn't, then select Auto Detection and then click OK. Close all of your open windows and reboot your system. After rebooting, return to Device Manager and then check again.
7. If it's still not set to DMA or Ultra DMA, then select DMA manually from the list and click OK. Reboot, then return to Device Manager and check it again.
8. If it is still not working, you may need to check your BIOS (Basic Input/Output Settings) or check your computer manufacturer's Web site to get more information about your system.



**Use Windows 2000's Disk Cleanup tool to free up space on your hard drive. The tool will get rid of unnecessary files on your system such as those left in your browser's cache.**

**■ Using Win2000 Disk Cleanup Tool.** If you find yourself running out of disk space and you want a quick way to free up some, try using Win2000 built-in disk cleanup utility. Although it's no substitute for getting rid of applications you aren't using, it can sometimes find wasted space that you might otherwise have missed. Also, lots of unnecessary files in your browser cache can take up space but can also slow down your browser's performance. So it's a good idea to use the Disk Cleanup tool regularly to eliminate unnecessary files from your drive.

1. Click the Start button and then choose Programs.
2. Choose Accessories on the Programs drop-down menu and select System Tools.
3. In the pop-up menu that appears, click Disk Cleanup.
4. Choose the drive you want to clean up from the list that appears. Then click OK.
5. The Disk Cleanup tool will analyze your hard drive to see how much space you can free up. Be patient while this is happening; sometimes it takes a few minutes for the tool to finish analyzing the drive, especially if it's a large one.
6. When finished, you'll have a selection of options to choose from to free up space on your drive. In the Disk Cleanup tab, you have the option to choose files to be deleted, so choose wisely before clicking the OK button.

### General System Tips

Use these miscellaneous tips to improve and monitor your system's performance. The tips in this section should be used with Win2000 unless stated otherwise.

**■ Using Performance Monitor.** One of the most obvious yet frequently overlooked ways to monitor your system's performance is to use the built-in performance monitor.

1. Click Start, select Settings, and then click Control Panel.
2. Double-click Administrative Tools.
3. Then double-click Performance icon to open the performance monitor.

Once the performance monitor is open you can view information as a chart, histogram, or report.

**■ Keep Win2000 Updated.** This probably seems like a no-brainer to most of us but some people are unaware they can update Windows with just a click of the mouse and an Internet connection. Keeping Win2000 updated is an easy way to keep your system

Name	Type	Date
(Default)	REG_SZ	(value not set)
WinSxS	REG_SZ	00000000 (0)
WinSxS	REG_SZ	00000000 (0)
WinSxS	REG_SZ	00000000 (1)
WinSxS	REG_SZ	00000000 (1)

**Optimize how well your system handle's disk intensive applications by changing the contiguous file allocation size.**

Name	Type	Date
(Default)	REG_SZ	(value not set)
WinSxS	REG_SZ	00000000 (0)
WinSxS	REG_SZ	00000000 (0)
WinSxS	REG_SZ	00000000 (1)
WinSxS	REG_SZ	00000000 (1)

**You can stop your NTFS (NT file system) volume from creating MS-DOS compatible 8.3 file names to speed up its performance. NTFS partitions with gobs of long file names will see the most benefit.**

in top shape and help avoid problems that can affect your performance.

1. Click Start and then click the Windows Update button to connect to the Windows Update site.
2. You'll be asked if you want to install an ActiveX component. Choose Yes.
3. The ActiveX component will scan your system to determine which updates you need.
4. The Windows Update screen will appear and dynamically format the Windows Update page so it shows you only the updates you need for your system.
5. Be sure to read the description of every update before deciding to install it since some may not actually pertain to your system.
6. Select the updates you want and then click the Download button. The Updates page will tell you how large an update is before you download it.
7. In order to insure a hassle-free download and install process, you should close all applications and stop using your computer during the update's download and install process.
8. Visit the Windows Update site at least once a month to check for updates for your system.

**■ Full Window Drag (Win2000 & WinNT).** View the contents of a window while dragging it across the screen instead of just seeing the standard outline.

1. Open the Registry.
2. Find this key:  
a. HKEY\_CURRENT\_USER\CONTROL PANEL\DESKTOP
3. Open the Edit menu, select New, click String Value from the pop-up menu to create a new



string value called DragFullWindows (or change the existing one), and change the value data to 1 to enable it. (If you later decide to disable it, set the value to 0).

4. Close the Registry and restart Windows so the changes can take effect.

■ **Stop Stealth Startup Programs (Win2000 or WinNT).** Once upon a time programmers put programs they wanted to start at bootup into the Startup folder. Users caught on to this and eventually started removing them. Now many programmers put them directly into the Registry instead, making it much harder for users to find them. If you have a lot of these it can adversely affect your system's performance. Here's how to deal with these sneaky shenanigans:

1. Open the Registry.
2. Find this key:
  - a. HKEY\_LOCAL\_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\RUN

3. Select the program you want to remove, right-click it, and choose Delete.
4. The program will no longer run at startup.

Be careful which programs you choose to delete since it might be hard to re-create the link without reinstalling the program if you change your mind about deleting it.

■ **How To Improve CD Audio Quality (Win2000).** Despite the fact that CDs store digital music, your sound card still receives analog signals. The digital sound is converted to analog signals via the DAC (digital-to-analog converter). Fortunately, Windows supports digital reading of CD music. The data is sent directly to the sound card or USB (Universal Serial Bus) speakers, bypassing the DAC.

1. On the Desktop, right-click the My Computer icon and click Properties.
2. In the System Properties dialog box, select the Hardware tab.
3. Click the Device Manager button.

4. Click the plus (+) key next to DVD/CD-ROM drives in the Device Manager.
5. Right-click the CD drive that you're using to play CD audio and choose Properties.
6. In the dialog box that appears, click the Properties tab.
7. Click the checkbox next to Enable Digital CD Audio For This CD-ROM Device.
8. Finally, click OK and restart Win2000 for your changes to take effect.

■ **Create A Fast Serial Port.** Ever get the feeling the serial port transfers between your PC and another device are taking forever or that your modem performance seems sub-par? It's possible the problem might be your COM (communications) port configuration. Follow these steps to improve serial port performance:

1. First, click Start, choose Settings, click Control Panel, then double-click the System icon.
2. Open the Hardware tab and click the Device Manager button.
3. When the Device Manager menu opens, open the Ports (COM & LPT) branch.

## A Look Into The Future: Windows XP

Windows NT is the past; Windows 2000 is the present. So what's in the future? Windows XP. Microsoft has just released beta 2 of what promises to be the best Windows of them all. Windows XP marks Microsoft's final goodbye to the Windows 9x code as it blends the best of Windows Me and Win2000 into one killer version of Windows.

**Choose your flavor.** The Desktop version of Windows XP will be available in two distinct flavors, Windows XP Home Edition and Windows XP Professional. The Home Edition will replace Win9x and WinMe. This version is intended for users that fall into the nonprofessional category. Users of the Home version will get the new user interface, increased support features, and more advanced entertainment options. Windows XP Professional will be geared more toward power users including

business and mobile professionals. All of the features found in the home version are in the professional version but there are also advanced management, security, and networking options available as well.

**Compatibility and stability.** In this release Microsoft is taking aim at past problems such as stability and poor interface design. We've all had to choose between the solid stability of WinNT and 2000 and the compatibility of Windows 98 and WinMe in the past. Windows XP is geared toward eliminating the need to choose by blending the best features of both minus the unstable Win98/WinMe code.

If you've ever had to use Win9x or WinMe as your main OS (operating system), and you've experienced numerous crashes while trying to get things done, you'll know what we mean. If Windows XP can achieve top rate stability

with a high degree of compatibility with existing hardware and apps, we'll all be much better off and happier with how things work.

**Radical new interface.** Windows XP is built on the solid foundation of Win2000, but it promises to deliver a radical new interface, currently being called Luna. We've been using beta 2 with the Luna interface for the past few weeks and so far it's been a pleasure to use. Windows XP is much more task-oriented than previous versions of Windows, meaning that it's generally easier for users to find what they need to do versus clunking around looking for icons to click.

Users of Win2000 and other older OSes will probably be shocked at just how radical XP's default interface is. First of all, it's very blue; the old blasé gray color scheme is gone. And you'll notice the Start button is now a bright green color. Icons are

more detailed and colorful. The OS also has much more of a cartoon kind of feel to it. Not to worry though, if you find yourself gagging at the site of Windows XP you can easily switch back to the older Win2000/Win98 interface. However, we'd recommend giving it a chance before you do that. You might find yourself enjoying Windows XP's face-lift more than you think once you've used it for a while.

The Taskbar has been redesigned and now puts application buttons into groups. For example, if you're running five different Internet Explorer windows, they can all be accessed by clicking the IE button and then choosing the window you want from the pop-up menu. This is a great way to clean the Taskbar of multiple window clutter and makes it easier to close entire groups of applications—just right-click the Application button and choose Close Group.



4. Select the COM port you want, right-click it, and choose Properties.
5. Open the Port Settings tab and increase the port's maximum transfer rate from 9600bps (bits per second) to 115200bps.
6. Click the Flow Control drop-down menu and enable Hardware Flow Control. This tends to work best for a PC to serial port device connection.
7. Click the Advanced button and make sure the Receive Buffer and Transmit Buffer settings are at the highest level.
8. Click OK and repeat these steps for any other COM port.
9. Your COM ports will now be running at the higher speed and you should notice a performance difference.

■ **Disable DHCP At Start Up.** If your Win2000 system seems to be taking an eternity to boot up you might want to consider eliminating Win2000's use of DHCP (Dynamic Host Configuration Protocol; or automatic IP [Internet Protocol] settings). Eliminating

DHCP might help speed things up by stopping Win2000 from using DHCP to try to resolve an IP address over your network. Be sure your dialup or DSL (Digital Subscriber Line) connections don't need DHCP to function before trying to use this tip.

1. Click Start, select Settings, and then click Control Panel.
2. Next, double-click the Administrative Tools icon and select Component Services.
3. When the Component Services dialog box appears, double-click Services in the tree.
4. Notice the DHCP Client Startup Type is Automatic. This means it starts automatically when Windows starts up.
5. Right-click DHCP Client and click Properties.
6. In the Startup Type drop-down menu, you can choose to set the DHCP Client to Manual or Disabled. If you are sure you don't need it, you can set it to Disabled; otherwise leave it set at Manual.
7. Click OK and reboot your computer for changes to take effect.

## ■ A Shortcut To Device Manager.

Keeping your system's performance in tip-top shape inevitably involves bringing up Device Manager to check your computer's configuration. But, unfortunately, there's no quick way to get to it. Instead you have to navigate through various folders until you're finally able to pull it up. With this tip, you can create a shortcut to Device Manager on your Desktop.

1. Right-click anywhere on your Desktop, select New, and then click Shortcut.
2. When the Create Shortcut dialog box pops up, type `%windir%\System32\mmc.exe %systemroot%\system32\devmgmt.msc` and then click Next.

(NOTE: When typing this in to the Create Shortcut dialog box, you will need to leave a space between the `mmc.exe` and `%systemroot%` portions of the command.)

3. Type **Device Manager** as the name of your shortcut and then click Finish.
4. Now, click the Device Manager icon on the Desktop to open Device Manager.

The Windows XP interface is also much more task-oriented than in the past. For example, the Control Panel is broken down into categories, making it easier to find the task that you need to complete, rather than the old icon-oriented way of navigating.

## Entertainment extravaganza.

Microsoft has worked hard to make Windows XP much more media-friendly than previous versions of Windows. To that end, it has increased support for games, digital photography, CD burning, and other entertainment-oriented activities. You can easily add, edit, print, or e-mail digital photos from within Windows.

Windows Media Player 8 is also included with Windows XP and this latest version includes support for playing DVDs, among other changes. Windows XP also includes built-in CD recording to make it easier for

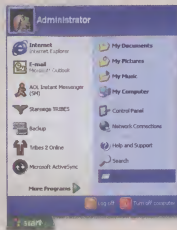
you to burn data, video, or audio onto CDs.

**Piracy prevention.** One possible orion-in-the-ointment for Windows XP is Microsoft's determination to prevent pirating of its new OS. In the past, Microsoft has decryed the number of pirated copies of its products and has gone to great lengths to try to protect them from illegal copying. The latest weapon in Microsoft's antipiracy arsenal is its activation requirement found in Windows XP. Each time a user installs Windows XP, he has 14 days to activate the software over the telephone or via the Internet. This requirement has gotten some flak in the press and in online message boards but the hype has been overblown.

We activated our copy of Windows XP in just a couple of minutes without having to

divulge our identity or other personal information. Instead the activation wizard just collected some basic information about our system and included that as part of the activation process. Some privacy advocates find even this level

of information gathering objectionable, though. You'll have to decide for yourself. Microsoft is still working out the final details of how the system will work when Windows XP is finally released. Hopefully it will find a balance between privacy and convenience, and the need to stop pirates from copying the software.



The Start button is now a brilliant green color and contains the most recently used application icons, as well as links to the most common functions of the operating system.

**Check out Windows XP.** If you're interested in checking out your own prerelease version of XP, you can try ordering a prerelease copy from Microsoft's site at <http://www.microsoft.com/windowsxp>. Be aware though that "preview" really means beta and that you should remember to back up all data before installing the OS. Your best bet is to install it on something other than your main computer so you don't cause yourself any headaches if you run into unexpected problems. □

If you want, you can even drag and copy your new icon onto your Taskbar to have a quick shortcut from there to Device Manager. Just right-click the Device Manager icon, drag it to the Taskbar, then drop it. When the pop-up menu appears, choose Copy. You'll then have an easy way to open Device Manager right from your Taskbar.

### ■ Open Task Manager Automatically.

Task Manager is another invaluable tool for monitoring your system's performance. But it's a pain to have to open each time you need to check something in it. You can save yourself time and effort by setting Task Manager up to start each time Win2000 boots up. It'll make monitoring your system faster and easier.

1. Begin by clicking Start, selecting Programs, and clicking Startup.
2. Right-click anywhere in the Startup folder, click New, then Shortcut.
3. When the Create Shortcut dialog box appears, type `X:\WINNT\system32\taskmgr.exe` (where X is the letter of the drive where Windows is installed) for the location of the item.
4. Click Next then type Task Manager as the name of the shortcut and click Finish.
5. Next you'll see a Task Manager icon in the Startup folder.
6. When Win2000 boots up you'll see a Task Manager icon in the Win2000 icon tray.
7. Double click the icon to instantly bring up Task Manager.

### ■ Create A Faster Parallel Port Connection.

If you have a fast parallel port device, you may be able to speed up its performance by using this tip. Be aware though that enabling an IRQ (interrupt request line) will not necessarily get faster parallel port performance and that any potential benefit you might get depends on whether or not your device uses an IRQ.

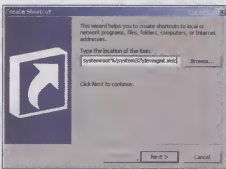
1. Click Start, select Settings, click Control Panel, and System Properties.
2. Go to the Hardware tab and then click Device Manager.
3. Open the Ports (COM & LPT) branch in Device Manager.
4. Right-click the Printer port (LPT1) and choose Properties.
5. When the new dialog box appears, click the Port Settings tab.

6. If you are absolutely sure your device can use an IRQ and you have a free one, choose the Use Any Interrupt Assigned To The Port option.
7. If you are not sure, then select Try Not To Use An Interrupt. If you use this option your parallel port device will be queried to find out if it needs an IRQ. If it does, it will be assigned that IRQ. If not, the IRQ will remain free.
8. Finally, click the OK button and save the changes you made.

## Memory Tips

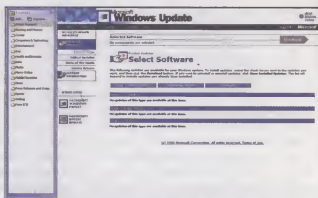
### ■ Cut Down On The Need For RAM.

Win2000 will never be confused with a petite OS. It loves RAM and devours it with relish. However, it is possible to tame its appetite for RAM by cutting down on the number of services it automatically runs. Freeing up RAM can help your system perform better.



**Device Manager is an important tool in keeping your system in top shape, but it's buried in Windows. Save time by creating a shortcut to it.**

1. Click Start, choose Settings, click the Control Panel, then double-click Administrative Tools, and select Services.
2. In the list of services that appear, choose one that is of no use to you and double-click it.
3. In the Properties dialog box, choose one of two options from the Startup Type drop-down menu:
  - a. Manual—This means Win2000 won't start the service at startup. However, you can start it manually or a service that uses it can start it.



**Use the Windows Update tool to keep your Windows 2000 system in peak condition with the latest updates from Microsoft.**

- a. Disabled—This means your or any other service that uses it cannot start the service.
  - c. You can also click the Stop button to immediately stop the service from running.
4. Click OK. Follow the same steps for any other service you want changed.
  5. Reboot your computer for the changes to take effect.

### ■ Change NT's Default L2 Cache Setting.

WinNT, unfortunately, only uses 256KB of L2 cache regardless of how much you actually have in your system. Using all of your L2 cache memory can help speed up your system significantly.

1. Open the Registry and find this key:
  - a. HKEY\_LOCAL\_MACHINE\SYSTEM\CURRENTCONTROLSET\CONTROL\SESSION MANAGER\MEMORYMANAGEMENT\SECONDLEVEL-DATACACHE
  - b. This key defaults to zero—which really means 256KB. Change the DWORD value to 0x200 if you have 512KB of L2 cache or 0x400 if you have 1MB of L2 cache.
  - c. After you make the change close the Registry and reboot WinNT for the changes to take effect.

**■ Improve Performance.** If you decide to use one, or even several, of the tips we discussed here, you'll be increasing your PC's performance in no time at all. **ES**

by Jim Lynch

# Hard Drives

## Guidelines For Maximizing Your Drive's Performance

**W**hen you buy a new, blazing fast processor, it stays fast. When you buy more RAM, say an upgrade to 256MB, you continue to have 256MB of memory. But when you buy a new hard drive, something strange and unfortunate happens. It degrades. Perhaps not physically—although that's a definite risk—but with regular use, the performance you get from your drive will gradually deteriorate.

This decline will likely stem from two causes: 1) The fuller a hard drive gets, the slower it tends to perform. As it approaches full capacity, the drive may even cease to function properly; 2) In the process of being used, copied, deleted, and moved, files tend to spread out across a drive, causing the disk to work harder in order to find any given file's many pieces. Tied to these are related issues, like how installing more applications will weigh down Windows, but here we'll focus on the physical drive itself and what

you can do to maximize its performance, both today and into the future.

### Your First Line Of Defense: Windows Utilities

Windows 98 and Windows Me come stocked with three main utilities (all of which can be accessed by clicking Start, choosing Programs, Accessories, and then System Tools) for keeping your hard drive running smoothly. We'll get you familiarized with how to use these and how to automate them so you don't forget to keep your drive in top shape.

■ **Disk Cleanup.** Garbage is the #1 biohazard on your hard drive. This may be programs no longer used that are clogging your disk capacity and Windows Registry. It may be old data that only serves to consume space. Just like you perform spring-cleaning on your house, Disk Cleanup does the same for your hard drive.

1. The options you'll encounter in Disk Cleanup will depend on your system. In WinMe, you may only find the Recycle Bin listed. Clicking the View Files button will show you all of the files listed in the Recycle Bin, and from these you can select which to keep or delete. If you simply check the box next to Recycle Bin in your list and proceed, all Recycle Bin files will be deleted.
2. Under the More Options tab, WinMe offers you three Clean Up shortcuts to other Windows areas. Under Windows Components, you'll access the Windows Setup tab under Control Panel's Add/Remove Programs dialog box, from which you can uninstall any Windows elements you're not using. The Installed Programs button takes you to the Install/Uninstall tab in the same Control Panel section. Finally, the System Restore shortcut takes you deep within Windows' Hard Disk tab in File System Properties. Here you can change the amount of memory allocated to restore sessions.

Novices are urged to use caution at this point. There is always the risk of changing or eliminating components necessary to your system's operation. When in doubt, leave the settings as you found them.

■ **Disk Defragmenter.** Commonly called Defrag (a carry-over from the DOS days), this utility is your hard drive's organizer. When data is written to a drive, it is stored in bundles of sectors called clusters. (In reality, Microsoft changed the name *cluster* to *allocation unit* as of MS-DOS 4.0.) Files can span any number of clusters, and because each cluster is related to the next for that file, clusters need not be adjacent; they can be spread out over the entire drive. Through the repeated process of writing and deleting files, this spreading of clusters, or fragmentation, means your hard drive has to cover more ground looking for related clusters. This means slower system performance. Disk Defragmenter places all your related clusters together to minimize the work required of your hard drive.

1. When you first start Disk Defragmenter, the program will display a list of all the fixed hard drive volumes (in Windows 2000) or a pull-down list of all fixed drives (in WinMe). Remember that partitions on a drive show up as separate volumes.

In Win2000, you can also see each volume's file system, capacity, and free space. The more information there is on a drive



the longer it will take to defragment. Your first task is to see whether or not the volume is significantly fragmented. To do this, highlight the volume and click the Analyze button. A lot of red in the Analysis Display bar can indicate serious fragmentation.

2. For more details in Win2000, click the View Report button when the Analysis Complete dialog box appears. Here you'll see exactly how the drive is fragmented and see if Windows recommends that you run the defrag routine.

3. In WinMe, you merely select the drive (or all of them) you want to defrag. The Settings button gives you access to three useful features.

a. Rearrange Program Files So My Programs Start Faster. As on a CD, a drive platter delivers its fastest performance at the outer rings. This option lets Windows rearrange your data so program files are located in these high-speed regions so applications start faster.

b. Check The Drive For Errors. This runs a Standard ScanDisk test concurrently with your defrag operation.

c. You can also select whether these settings apply only to this Disk Defragmenter session or should be applied each time you defrag your hard drive.

4. As Disk Defragmenter is running, you'll note a button named Show Details. This brings up a map of your hard drive, using different colors to illustrate different types of fragments. It can be fun to watch Defrag as it shifts data around your drive, but the operation will run more quickly if you click the Hide Details button and let the utility run in minimized mode.

While you should avoid filling any drive volume beyond 75% of its capacity, Defrag has difficulty performing its job when your volume passes 85% capacity. If you try to run the program in such a cramped environment, Defrag will alert you to the problem, suggest that you try to free some additional space, and offer you the option to proceed anyway.

■ **ScanDisk.** ScanDisk examines your hard drive for file problems, especially lost or cross-linked clusters, and can probe the physical media for defects. Think of it as a physical exam for your disk. Especially on older drives, running ScanDisk regularly is a must because if you start losing sectors to physical

errors, there's no way to recover the data contained in those areas. Also keep in mind that, like a cancer, sector damage generally starts small, then metastasizes, devouring your disk. ScanDisk can help you catch and cure early warning signs of potential widespread damage.

1. ScanDisk begins by asking you to select which drive you wish to scan. Unfortunately, there is no option for selecting multiple volumes at once. If time is short, begin with testing your primary volume, usually drive C:

2. Next, select whether you want to run a Standard or Thorough test. Thorough will check the volume for physical errors whereas Standard only examines for corruption in files and folders. Be warned that Thorough tests can take many hours, especially on larger drives.

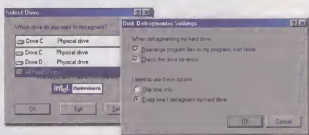
3. The Options button next to Thorough offers several interesting features.

a. In the Areas Of The Disk

To Scan section, you have a few choices. Disks have two types of areas: system, where items such as boot files are stored, and data, which is essentially everything else. When ScanDisk detects a bad media sector, it attempts to move the contents of that sector to a different healthy sector. Sometimes, the data is too corrupted to extract. Also, some older programs only know to look for system files in a specific location, so moving them may still not fix the problem. Normally, you'll want to scan both system and data areas, but advanced users may want to select one or the other.

b. Do Not Perform Write-testing. A Thorough test reads every sector of your disk. By default, the sector's contents are then written back to the sector to confirm that both read and write functions are operating normally. If you need to save time, check this box to disable write-testing.

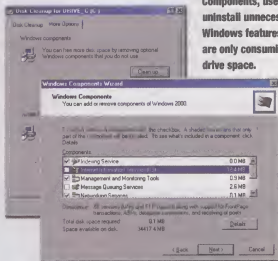
c. Do Not Repair Bad Sectors In Hidden And System Files. Again, some applications may not work if key system files are moved, as normally happens when



In Windows Me, the Settings button for Disk Defragmenter provides options to both improve overall system performance and remember your settings for future Defrag sessions.

In addition to automating several maintenance tasks, Disk Cleanup gives you shortcuts to other Windows areas. Here in Windows

Components, users can uninstall unnecessary Windows features that are only consuming drive space.



ScanDisk discovers a bad sector. Check this box to let these files sit where they are. Realize that faulty system sectors may quickly result in a defective drive.

4. Check the Automatically Fix Errors box so ScanDisk won't prompt you every time it encounters a defect. The only reason not to fix an error is if it occurs within a system file. Use the Options list (above) to correct for this. Otherwise, if you're facing many disk errors, manually approving each correction can become extremely tedious.

5. Finally, before you start scanning, you may want to click the Advanced button and examine the advanced features. While too numerous to list individually, the two most important are Cross-linked Files and Lost File Fragments. For the best assurance of data integrity, set these to Make Copies and Convert To Files respectively. In the



latter case, this saves your stray fragment as a text file in your root directory, viewable with any text editor. In reality, however, very few people ever bother with this, and changing the option to Free will just delete the fragment.

Also, in WinMe if you want to eliminate the automatic ScanDisk that initiates every time your system accidentally resets, check the Prompt Before Fixing

Errors On Improper Shutdown option in the lower right corner.

6. While ScanDisk is running, if anything changes on the volume being scanned, even the creation of a little temp file, the program will detect that the volume's contents have changed and start its process over from the beginning. With frequent interruptions, ScanDisk may never finish its job. This is why you want to exit or

suspend all possible activity while the application is running.

- a. Press CTRL-ALT-DELETE to bring up the Task Manager or Close Program dialog box. Highlight every running item that isn't Explorer and click the End Task button. (There is no batch selection, so you'll have to end them individually.) Sometimes it may take many seconds for a program to fully close.
- b. If your system uses a screen saver, you'll need to disable it. Right-click an empty spot on the Windows Desktop, select Properties, and then click the Screen Saver tab. In the Screen Saver pull-down menu, select (None). Click the Apply button, then OK. Once ScanDisk is finished, you can return here to re-enable your screen saver.

## Troubleshoot Your Hard Drive

Even the best preventative maintenance can't stop some problems from occurring. If the above material doesn't stave off the hard drive blues, check for these common problems.

**Problem:** I just upgraded the hard drive and now the system will not boot.

**Solution #1:** The cables are improperly plugged in. While you can usually only plug an IDE (Integrated Drive Electronics) cable into a hard drive in one orientation—thanks to the bump in the middle of the connector—you can plug it in either correctly or upside-down into the motherboard. All IDE cables are flat and have a wire on one edge colored red, either entirely or in stripes. This red wire feeds into connector socket 1. On the motherboard, one corner of the IDE connector will have a numeral 1 printed next to it. The red wire always plugs in next to pin 1. If you have the red wire facing away from pin 1, the connection will not work. Also, make sure that all 40 pins on the motherboard's IDE connector are matched up to the cable connector. It's common to have a pair of end pins miss the connector.

**Solution #2:** The cables are incompletely plugged in. To ensure a tight connection, unplug both the IDE and power cables, and then firmly reseal them. Apply firm pressure and make sure neither side of the cable will slide forward any more.

**Solution #3:** The drive is not jumpered properly. Your new drive may be jumpered as a "master." If so, and if the new drive is on the same IDE channel as the old drive (which is already set as the master), the drives will conflict with each other. Refer to the diagram printed on your drive and make sure it is either set as the "slave" or move it to the second IDE channel.

**Problem:** My hard drive is rattling and it scares me.

**Solution:** Hard drives do get old and motors wear out. Like most things in life, hard drives usually give some warning before they die, and one symptom of impending doom is the death rattle. When you hear it, get a replacement drive as soon as possible and back up all your information immediately. But wait! Are you sure that rattle is coming from the hard drive? Open up the PC and start feeling around. If it's the hard drive, you'll feel the device vibrating. A more common source of rattling, however, is the system's power supply. After this, check the fan mounted on the CPU. Also check the chassis itself. Loose screws and bolts may be allowing the metal plates to vibrate against one another, and the CD drive is often the source of the vibration.

**Problem:** New drives from different vendors keep dying on me. Am I cursed?

**Solution:** Magic and poltergeists aside, the most likely cause is electrical. Your PC's power supply may be partially defective, slowly roasting your drives with a surplus or deficit of voltage. You may have a defective connector coming off the power supply, as well. Have a technician examine the unit or just replace the power supply. The problem may also be environmental. While modern hard drives are well-sealed, small particles, especially smoke, may infiltrate your drive's case and get between the platter and head, scraping across the platter surface. Similarly, quickly moving a drive from cold to warm conditions can cause moisture to condense within the drive. If condensation collects on the platter surface, it can form an obstruction just like other particles. □

■ **Maintenance Wizard.** To help consumers and their usual urge to procrastinate, Microsoft developed the Maintenance Wizard for Windows 9x and WinMe. This routine lets you schedule times and procedures for Windows to automatically run ScanDisk, Disk Defragmenter, and Disk Cleanup without your intervention. Theoretically, you can turn the wizard on and never worry about disk maintenance again. (In reality, we suggest a more cautious attitude.) The easiest way to use Maintenance Wizard is to start the application, select the Express setup option, and accept all the program's defaults. However, to illustrate, we'll select the Custom setting in WinMe and step you through the various options.

1. Select A Maintenance Schedule. This designates one of three time slots (nights, days, or evenings) for the wizard to do its work. In general, we suggest the Nights setting (midnight to 3:00 a.m.) if you leave your system on around the clock. Then click the Next button to continue.
2. Start Windows More Quickly. As you load software into your system, Windows will accumulate a collection of background applications that load every time the operating system starts. These can be items like your instant messaging client, printer monitor, or PDA synchronizing utility. They can also be useless applets planted by marketers that only serve to slow your system down. In this screen, you can select which apps get to load from your Windows Startup folder. Be careful in which items you choose to disable as these may be necessary for the functioning of other programs.



3. **Speed Up Programs.** This automates the running of Disk Defragmenter. Note that the Reschedule button gives you options for when the utility will run, which may not necessarily mesh with the settings you selected in the Select A Maintenance Schedule screen. We recommend running Defrag at least once per month, more if the drive is under heavy use.

4. **Delete Unnecessary Files.** Here, the wizard presets you with a list of file types to periodically delete, ranging from temporary Internet files (which are safe to delete, although this may slow your browsing time) to the application debugging information (which nearly all consumers ignore). In general, you should be able to select all of these file types with no negative effects to your system.

5. **Scan Hard Disk For Errors.** Choose whether or not to let Windows check your files and folders for errors and fix them automatically.

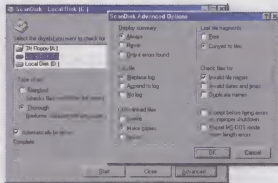
6. The last screen offers a synopsis of your new settings and a checkbox to enable the wizard to run immediately after you click the Finish button.

### Check Your Configuration

We've now examined the routine ways to keep your hard drive in good shape. Unfortunately, drive problems can arise from a number of sources and require some less obvious solutions.

■ **Upgrade.** Just like a stereo never sounds as good after the first week or two of listening, you grow used to your drive's performance level. Even if the hard drive stays in the same shape as the day you bought it, technology marches on, specifications steadily improve, and you're ultimately left with a dinosaur, albeit a healthy one. If speed matters to you and your hard drive feels comparatively poky, consider buying a newer, larger unit and make your current hard drive into a secondary drive. You can copy the contents of your old drive to the new one and hardly miss a beat.

■ **BIOS Support.** The BIOS (Basic Input/Output System) controls how your motherboard communicates with surrounding ports and peripherals, including hard drives. Older BIOSes may not recognize a newer hard drive or may



With plenty of options, ScanDisk helps analyze your hard drive for physical and file-related defects that might slow down or possibly ruin your hard drive.

only register part of its full capacity. As with other system components, it's important to periodically check for software updates for your hardware to ensure the device is working to its full potential. However, while companies like AML and Award are the original BIOS designers, the motherboard manufacturer is responsible for fine-tuning the BIOS to the board's own peculiarities. This is why you normally seek BIOS updates from your motherboard manufacturer, not the BIOS company.

## FAT Cluster Sizes

Volume Size	Cluster Size
<b>FAT16</b>	
0MB to <16MB	4KB (actually FAT12)
16MB to <128MB	2KB
128MB to 256MB	4KB
256MB to 512MB	8KB
512MB to 1,024MB	16KB
1,024MB to 2,048MB	32KB
<b>FAT32</b>	
0MB to <260MB	512 bytes
260MB to 8GB	4KB
8GB to 16GB	8KB
16GB to 32GB	16KB
32GB to 2TB	32KB
<b>NTFS (for Windows NT 3.51 and later)</b>	
0MB to 512MB	512 bytes
513MB to 1GB	1KB
1GB to 2GB	2KB
2GB to 16E*	4KB

\*E means exabytes. An exabyte is  $2^{24}$  bytes, or 17,179,869,184 terabytes.

■ **FAT System.** The FAT (file allocation table) organizes how information is written to hard drive and determines how large each cluster is based on the size of the partition. (See the "FAT Cluster Sizes" sidebar for a breakdown on FAT systems and their partition/cluster sizes.) Cluster size becomes important to drive performance because of how files are written. Say you have a 40GB hard drive, all partitioned into one big volume, formatted with FAT32 under WinMe. This would give you cluster sizes of 32KB. Now say you create a short text document of only 3KB. Because only one file, or part of one file, can be written to any given cluster, a 32KB cluster is assigned to your 3KB file, leaving 29KB wasted. Over the space of a large drive, this wasted space can accumulate into possibly hundreds of megabytes.

In general, more current FAT systems use smaller cluster sizes given the same volume size, so you may want to both use smaller partitions and a more modern FAT. However, juggling numerous partitions and their respective contents may be more of a headache than you bargained for, and you may find that some of your applications may not work under your new file system, so use caution. Some versions of Windows offer a FAT conversion utility, which can be accessed by clicking Start, choosing Programs, Accessories, System Tools, and clicking Drive Converter. Win2000 users wanting to convert to NTFS (NT file system) will need to open a command prompt and type in the convert command `convert X: /fs:ntfs` (where X is the drive letter).

Note that Windows is generally backward-compatible with previous FAT systems, letting you run multiple FATs on different volumes simultaneously.

■ **Separate Channels.** Generally, PC motherboards offer two IDE (Integrated Drive Electronics) channel connectors, each of which is capable of supporting two IDE drives via a ribbon cable. If both drives on a single channel are passing data concurrently, especially if the drives are high-speed hard drives moving steady masses of files, this may result in a traffic jam on your IDE channel (technically called an interleaving error) which will impair drive performance. If you're using two hard drives, keep them on separate IDE channels for best results.



So do yourself a favor and make an annual ritual out of formatting your drive. This will force you to re-examine what content is needed and what is fluff. If you know a format is coming up, you'll take the precautions necessary to identify your data and back it up onto media like CD-R (CD-recordable), from which it can be easily reinstalled. The object is to minimize your garbage applications. You can most easily accomplish this reformat procedure through two methods.

#### 1. Buy a high-capacity tape drive.

Once you have your essential applications installed to your hard drive and nothing else—we'll call this the "core configuration"—make a complete system backup and store the tape somewhere safe. This is a precautionary step in addition to your other system backups that will contain secondary applications and all your data. You won't necessarily know at what point corruption took root in your system, but you will have a fully functional core configuration on hand and ready to go, just in case your latest tape's restore session doesn't fix the problem. As needed, you can go back and begin adding secondary apps and data to your core configuration on the hard drive. The object is to get you up and working in the shortest possible time.

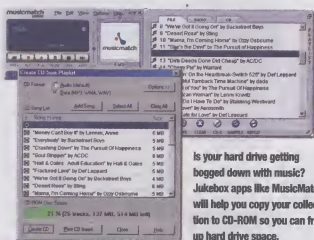
2. Alternatively, use a second hard drive. If you don't want the time and expense involved in tape drives, purchase a second hard drive on which to install your core configuration. Use a copying application like Symantec's Ghost (<http://www.symantec.com>) to mirror the entire drive contents onto the disk that will be your primary hard drive. Remove the second from the system and store it someplace safe. This way, if catastrophe strikes your system, even an electrical one which might physically destroy your primary hard drive, you have a back-up drive on hand that can be installed and running within minutes.

#### ■ Do You Know Where Your Apps Are?

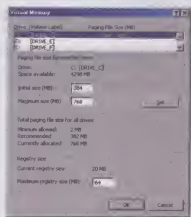
Some people are organized, and some are not. Whether your boxed software is spread from the attic to the garage or you downloaded three dozen diverse shareware applications from who knows where, reinstallation will

be much smoother if you know where everything is located.

1. Prioritize. Your core applications should be kept together, perhaps with a rubber band (not too tight) or in a box. Keep these within reach of your PC. Your secondary apps can go together on a shelf anywhere. The key is to a) keep your core



Is your hard drive getting bogged down with music? Jukebox apps like MusicMatch will help you copy your collection to CD-Rom so you can free up hard drive space.



Virtual memory uses your hard drive to help process tasks normally handled in RAM. Altering Windows' default settings can—under certain conditions—help improve system speed.

apps separate so you can reinstall them in a hurry and b) pick one place for your discs to live, period, so they don't get scattered about.

2. Create archives. When you download software, whether it's a driver update or a new game, download it into the default directory from which you will execute it (such as C:\NewInstalls). However, before you execute or uncompress the file, copy it into an archive folder. We recommend two such folders: C:\Updates

and C:\ProgramArchive. Updates can hold anything from DLL (dynamic-link library) files to BIOS revisions to a new USB (Universal Serial Bus) driver. ProgramArchive is where you put all of your compressed EXE (executable) and Zip files. Periodically, backup these two folders to removable media. Now, when it comes time to reinstall after a disaster, all of your software is in one or two highly organized locations. Trying to hunt down all these files from scratch would take you many hours or even days.

■ **Offload.** These days, the urge to create massive archives of digital audio, photo, and movie files is almost irresistible. Music lovers might rack up several gigabytes in MP3 files alone, culled from their CD collections and other sources. It doesn't take long for such archives to start dragging down your drive's speed. Since discs can play back multimedia as effectively as diskettes, why not offload your multimedia to CD-R or recordable DVD? The exact media you choose may be determined by the size of your archives and/or files. (Video archivers will want DVD.) This carries the dual advantages of both freeing your hard drive(s) and having a safe removable archive in case disaster strikes your system.

■ **Final Word.** If this sounds like a lot of work to endure for a problem that may or may not ever affect you, take heart. With Windows' Maintenance Wizard, the bulk of the dirty work is managed for you automatically. For additional help, you can turn to third-party utility suites such as McAfee Utilities (<http://www.mcafee.com>), Ontrack Data's SystemSuite (<http://www.ontrack.com>), and Symantec's Norton SystemWorks (<http://www.symantec.com>).

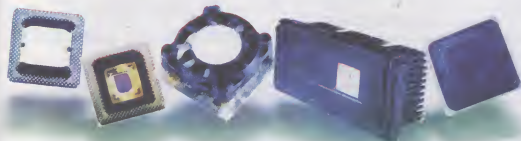
With the grunt work handled, the remaining hard drive maintenance is merely a process of developing good habits and taking commonsense precautions. Hope for the best but plan for the worst, and your hard drive will deliver many years of top-notch performance. **ES**

by William Van Winkle

**TIPS**

# Memory

## What You Need To Know To Get The Most From Your Memory



**Y**our memory subsystem is just as vital to your PC as your motherboard or CPU. Without RAM, your system can't boot, much less act as a workspace for your applications and data. A strong memory configuration can do much to improve your system's performance. Weaknesses can do anything from slow you down to crash applications to render your system inoperable.

What should you do to make sure your memory is running to its fullest potential? For starters, check out these tips.

### The Fundamentals

Many users question basic issues, sometimes even before the system is purchased. There are many types of RAM, and deciding factors like what type and how much to buy may influence how to rest of your PC gets configured. So let's look at some preliminary issues before moving on.

■ **How Much Is Enough?** Common wisdom says you can never have enough RAM, although this is not entirely true. All motherboards have physical limits to how much memory they can accommodate, and you should be sure to check this number before committing to a motherboard.

Users with older configurations should be aware that memory is also bounded by your OS (operating system). Years ago, DOS had a native RAM limit of 1MB. Today, Windows still has memory recognition boundaries although the numbers are in excess of what most motherboards can accept. Windows 2000 Professional, for instance, has a 4GB maximum.

When shopping for a new system or upgrading your OS, at least double the amount of RAM

Microsoft says your OS needs. Windows Me is rated for 32MB of memory, so buy 64MB to 128MB. When Win2000 says it needs 64MB, just assume 256MB is closer to reality.

■ **What You Should Buy.** If you already have a PC and are upgrading, your decision is usually settled already. Check your owner's manual or original invoice and see what type of memory your machine has. Recent models will typically use a variety of SDRAM (synchronous dynamic RAM), but you'll need to note the exact speed: PC66, PC100, or PC133. If your system runs PC100 SDRAM and you find PC133 SDRAM for about the same price, buy it. The new module(s) will automatically slow down to match the surrounding memory, but should you upgrade to a PC133-compatible motherboard, your new memory will already be able to match the higher speed.

If you're looking at next-generation, high-speed RAM, the two choices appear to be DDR-DRAM (double-data-rate) and RDRAM (Rambus). Neither format will work on contemporary SDRAM motherboards, and the type you select will probably depend on your choice of CPU. Pentium 4 users will likely opt for RDRAM while Athlon aficionados will go with DDR.

■ **Room To Grow.** As you add RAM to your system, you'll have the option to purchase different sized modules. If you're adding 128MB, you could either purchase one 128MB module or two 64MB modules, which may cost less depending on the current market. As a rule, always go for single modules. Most motherboards only have two, three, or four RAM slots, and you want to try to keep as many of these as possible empty for future expansion. Saving a

few dollars today at the cost of sacrificing a RAM slot is wasteful in the long run.

### RAM Speed

Adding more RAM and using faster module formats are obvious ways to improve overall memory and system performance. Less obvious are the ways you can tweak your PC to help the memory help you. Following are some of the best ways we've found to maximize memory performance from the software side.

■ **Modify Your BIOS Settings.** We could spend an entire article discussing the ins and outs of BIOS (Basic Input/Output

System) fineries, some of which control memory operation. In a nutshell, chances are that your system comes preconfigured for the most stable BIOS performance. However, if you're willing to risk trading some stability for a little better RAM performance, there are some ways you can "overclock" the memory to make it run faster. (Users are strongly advised to use these steps at their own risk. Overclocking denotes running parts at higher speeds than they're rated for. Vendors will say: "You fry it, you buy it.")

1. The standard CAS (column address strobe) latency for SDRAM is 3, but the majority of modules can operate at 2, which is faster.
2. Try stepping down the RAS (row address strobe) to CAS Delay just a bit.
3. Enable Shadow System BIOS. This lets the BIOS run from main memory, which is faster.
4. Enable System BIOS Cacheable. This lets the BIOS run from L2 cache when needed, bestowing even faster performance than shadowed, although both should be used together.

■ **Downsize Your Start List.** After prolonged use and adding several applications, you'll notice that Windows loads numerous applications in your system tray and even more in your Task List. (Press CTRL-ALT-DELETE to view these.) Each of these consumes memory resources, and if you don't need a program to be running, you'll improve your system performance by eliminating them from your startup procedure.

1. Click Start, Run, type msconfig in the Open box, and click OK.
2. In the System Configuration Utility dialog box, go to the Startup tab and uncheck every



item you don't want to load at each Windows boot. Then click OK.

Win2000 is far less flexible for modifying start items, but most of the major items are stored in a Registry folder. Click Start, Run and type `regedit` to open the Registry Editor. Browse to `HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\RUN`. Delete the entries you don't want loading at startup, but be careful that you know exactly what you're deleting.

■ **Unnecessary Apps.** Close down temporarily unnecessary apps even if you've pared down your list of startup applications and applets. You may be using your computing time for a single task, such as photo editing or spreadsheet processing. If so, you don't need to maintain the overhead of your device drivers, Task Manager, and other occasionally-used programs. You have two options for getting rid of these in Windows 98 and WinMe.

1. Press `CTRL-ALT-DELETE` and click the Task Manager button to bring up your active programs list. Explorer is your Desktop application and must always be running, but chances are the rest are expendable if you're only using one given application. Highlight the item you want to close down and click End Task. You'll need to probably repeat this process several times, and some applets may take several moments before timing out and forcing you to click an End Now button.
2. As you did above, click Start, Run, type `msconfig` in the Open box, and click OK. Under the General tab, click the option for Selective Startup, and then uncheck the Process System.ini File option. Click OK, then reboot. Now Windows will load with a totally minimal configuration, without all your extra background apps. This may also cause certain drivers not to load, so you may lose some device functionality. When you finish your single task, just run `msconfig` again and re-enable the Process System.ini file.

### Increase Stability


As RAM resources become strained, your system stability can suffer, resulting in application crashes and sometimes outright system crashes, both of which can mean lost time and work. Try these handy suggestions to keep your memory running reliably.

■ **Plug Memory Holes.** When you run an application, it demands a certain amount of

memory resources with which to work. When you close the application, it is supposed to release these resources back to the system. Sometimes, this doesn't happen with 100% accuracy. When a program fails to release all of its memory resources, this drains the amount of RAM available to other applications and creates a "memory hole." This lost space can only be recovered by rebooting the system.

You can try to monitor your memory resources and identify which applications are the greatest memory drain culprits.

In Win9x and WinMe, click Start, select Settings, click Control Panel, Settings, then go to the Performance tab. You'll see the

percentage of free memory available. Ideally, you should be able to start an application, close it, check your memory resources again, and see the same number. If you notice an application draining off resources after repeated openings and closings, either prepare yourself to reboot often or consider switching to a similar, alternative application. 

by William Van Winkle

(NOTE: Visit the Smart Computing Web site at <http://www.smartcomputing.com/guide/0907/memory.htm> for more memory tips that will help keep your memory running smoothly.)

## Troubleshoot Common RAM Ailments

**I**t never fails. No matter what you do to keep your system running smoothly, there is always the chance that something will go wrong. And when it does, you'll be ready if you keep these problems and solutions in mind. Here are three common problems that are directly related to RAM, and how to fix them.

**Problem:** My system has worked fine for months, and I haven't changed the configuration recently. But now I'm getting a lot of RAM errors.

**Solution:** A little-known ailment that plagues many systems is incompatible metal contacts. Along the bottom edge of every system RAM module is a line of metal contact points that align with corresponding contacts in the motherboard's memory slots. These contacts are made with either gold or tin.

However, these materials will corrode each other over time, a process known as fretting, which is why many systems that mix gold and tin start to exhibit otherwise inexplicable memory errors after


several months. Of course, you can clear the contacts and continue using the mismatched set, but it's always best to confirm what kinds of contacts are used in your motherboard's RAM sockets, then make sure your memory conforms accordingly.

**Problem:** I get memory errors when I save a large file to my hard drive.

**Solution:** If you notice memory errors cropping up when your system performs a hard drive or CD drive activity, you're probably facing an overtaxed power supply. Some systems use cheap power supply units with just enough juice to fuel the PC in its base configuration. But say you add another drive or two. Now the system is working on the edge of its limits, and all it takes is a drive spin-up to cross the line and drain off too much voltage from your ultra-sensitive memory modules. Even though the shortage may only last a fraction of a second, the glitch is enough to cause an error. Another clue to this problem is that the reported memory error location changes with each new instance.

**Problem:** I just installed another RAM module that I know is 100% functional. There's no corrosion on the module's contacts, but the new part doesn't register in my system.

**Solution:** There are two probable causes. You may have installed the module in the wrong RAM slot. Different motherboards require modules to be added in different ways. Some older systems require modules to be installed in pairs. You may need to make sure you fill Bank 0 first, then Bank 1, then Bank 2. See your manual for specifics on this.

The other possibility is that your RAM socket may not be making solid contact with all of your module's leads. The most common reason for this is dust and dirt clogging a slot. Use a can of compressed air to blow out the slot and clear away any obstructions. If the system only recognized part of the new module, that would indicate the use of an improper module type. 



# TIPS Video Cards & Monitors

Discover How Easy  
It Can Be To See Clearly



For business and home computer users alike, using a PC that suffers from video display problems can make even simple

tasks unbearable. Not only can you get eye-strain and headaches from looking at a monitor with a poor picture quality, but you will

probably be less likely to sit down and get your work finished. Fortunately, correcting video display problems doesn't usually require calling in the PC tech support cavalry. Whether you use a traditional monitor or a flat-screen LCD (liquid-crystal display), you can do a few things on your own to clear things up.

■ **Video Card & Driver.** Have you ever seen a Web page displayed on a monitor running in 16-color mode? It kind of looks like a cartoon drawn with only a handful of colors. There are a couple of reasons why this can happen; the most common is an incorrect video card driver.

The video driver is one of the most important drivers in your computer. It controls both what you see by way of the video card itself and the fonts you see in your documents and other programs. If you are using the wrong driver for your video card, you can suffer from system lockups and other odd behavior, too.

Get the right driver for your card. The first step in correcting a bad video driver is to determine what video card you have. You can get this information by referring to your computer's documentation to find out the specific make and model of your card. Once you know what type of video card you have, you can

## DirectX 8.0a

DirectX is a set of instructions that enhances multimedia elements in computing. Microsoft's latest version, DirectX 8.0a, acts as a translator between a software program and your computer's hardware and operating system. DirectX lets developers design a program that can access the hardware components of a PC even if the programmers don't know the code that directly addresses each piece of hardware. Because it directly controls your video card, DirectX can have an impact on how well your system runs.

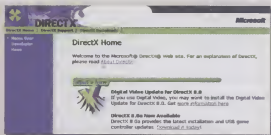
If you enjoy many of the DirectX-enabled games out there, upgrading to version 8.0a is a must. It is available as a free

download from <http://www.microsoft.com/directx>.

The right tool. If you find you're having trouble with your system and you believe DirectX may have some part in it, there are a couple of things you can do.

The first is to run the DirectX diagnostic tool, called `dxdiag.exe`. This tool will help you check out your system for compatibility with DirectX. Click Start, Run and type `dxdiag.exe` in the Open text box. Click OK and in the DirectX Diagnostic Tool dialog box, click the Next Page button and check the Notes section of each page to see if the tool lists any problems.

The latest version. The next thing to do if your video card is



You can find information about DirectX and download the latest version from the DirectX home page.

having trouble running DirectX is make sure you have the latest card drivers from the manufacturer. The DirectX diagnostic tool we just mentioned can help you determine the current version of your video driver. In the DirectX Diagnostic Tool dialog box, click the Display tab. The information about your video card, including name, manufacturer, chip type, and total memory, is in the Device section. The driver used

for display is listed in the Drivers section of the same tab.

Another reason to update your video driver is if you notice that your video seems to run more slowly now than DirectX 8.0a is on your sys-

tem. Due to some programming changes in DirectX 8.0a, some older video drivers cannot take advantage of the newly updated 3-D acceleration techniques called "hardware Texture and Light." If you notice a slower frame rate or other video performance issues, this may be the culprit. Hurry to your video card's Web site for the latest and greatest video card driver. □

## Troubleshooting Tips

**A**re you plagued with a pesky monitor or video card problems? See if these troubleshooting tips can help.

**Multi-monitor woes.** One of the coolest features of Windows 98, Me, and 2000 is their support for multiple monitors. This support means that by using either additional video adapters or special video cards with two or more outputs, you can stretch your Windows Desktop across a second monitor. You can do such things as drag a program from one monitor to the other and view a Web page on one while reading e-mail on the other; the second monitor works just like the first.

This is a cool feature, but it's very frustrating if you have problems making this work. Because you are working with two video cards, things can be a little confusing. The first thing to do is make sure you have the latest drivers for both video cards installed on

your system. Follow our steps in the Video Card & Driver section of the main article for doing this update.

If you have the correct drivers, and things still do not look right, make sure that both video cards are set to the same resolution. Because you are working with two different cards, you have to choose which one you want to change from the Display Properties dialog box. (Right-click a blank space on the Desktop and choose Properties.) In the Settings tab, you will see both video cards in the Display section. Click the down arrow to choose the card and then set its colors and resolution from the available choices.

A common problem with multiple monitors is that the wrong monitor comes up as the main monitor. The primary monitor is the one that has the Windows Start Bar on the screen. To change which one is the primary monitor, click the video card you want

to make primary in the Settings tab of the Display Properties dialog box and check the box next to Use This Device As The Primary Monitor to make the change. Click Apply then OK.

**Keep Magnets Away.** One often overlooked display problem can be the result of keeping unshielded electronics near the monitor. Things such as speakers, magnets, and electric motors give off magnetic radiation, which effects the alignment of the electron beams lighting up the phosphor dots on your monitor.

If you notice a strange discoloration near an edge of your monitor, a magnet may be to blame. Try moving the monitor in the opposite direction of the discoloration on the screen. Also look around for possible causes of the problem. Most PC speakers are shielded for use near monitors, but if you use older speakers, they may be part of the problem. □

rect monitor driver installed on your PC can also affect how well your system looks and works, as well as how long your monitor may be around.

Because Windows is a Plug-and-Play operating system (it can detect and configure new hardware automatically, with almost no intervention from the user), it tries to go out and set up all of the hardware in your system for you. Chances are that Windows checked out your monitor and set it up as a Plug-and-Play-compatible monitor. More often than not, this is fine, but if you want to get the most out of your system, you will want to find the correct monitor definition file.

To update your monitor driver, follow the same instructions you used to change the video card driver above, except instead of clicking the plus (+) sign next to Display adapters, you'll click the plus (+) sign next to Monitors. This process will tell the video card what resolutions and refresh rates are available in the monitor. This is important because not all monitors can handle the same resolutions and scan rates, and you can damage your monitor if you choose a resolution or refresh rate beyond its capabilities.

**Contrast and brightness.** One of the more common display problems comes from not using the correct contrast and brightness settings on your monitor. If your monitor looks like it has been whitewashed or if everything is kind of dark and white looks more like gray, this is the place to start.

Contrast is the difference between the lightest and darkest shades of color on your monitor. You can usually control the contrast level by turning a dial located at the front, bottom edge of your monitor. Some monitors, such as the newer digital monitors, have a jog wheel you can use to change the contrast settings, and still other monitors have buttons.

You will want to set your monitor's contrast on the high side to provide the greatest separation between dark and light colors. To set your contrast, simply turn the dial clockwise to increase the contrast level and counterclockwise to decrease the level. (If your monitor has buttons, push the down or left-pointing arrow to decrease the contrast level and the right-pointing or up arrow to increase the level.) Decreasing the level will make the monitor get darker because the difference between light and dark is getting smaller. Increasing will lighten the screen and increase the difference.

The brightness control changes the overall light level on the monitor. (You can usually

visit the manufacturer's Web site or call the company on the phone to get the right driver for your video card.

**Install the new driver.** Now that you have the correct driver, it is simply a matter of installing it on your PC. The easiest way is to go to Start, Settings, Control Panel. Double-click the System icon and click the Device Manager tab. In Device Manager, click the plus (+) sign next to Display Adapters to view your installed video card. Right-click the listed video card and choose Properties from the pop-up menu.

Click the Driver tab in the ensuing dialog box and then click Update driver. The Update Device Driver Wizard will prompt you for the location of the driver you want to install. Either type in the path to the files you just downloaded or browse to it. Once the new driver is installed, reboot your PC so the changes can take effect.

The last step is to set the number of colors to display. Right-click an open space on the Desktop and choose Properties from the pop-up menu. Click the Settings tab to show your current video settings. To increase the number of colors your video card will display, click the down arrow to the right of the Colors box. You should have choices from 16 colors to True Color (24 bit). Pick the setting that looks best to you and click OK to save.

■ **Monitor Improvements.** Like a dirty window, a monitor that is flickering, too dark, too bright, or otherwise impaired has a hard time serving its purpose. Try these tips to improve the view.

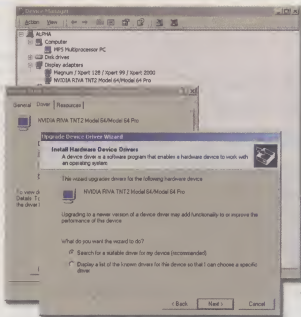
**Monitor driver.** Your video card isn't the only thing reliant on a driver to work properly: Your monitor probably has a driver to go along with it, too. While not nearly as important as the video card driver, having the incor-

change the setting of your monitor's brightness with the same tool you used to change the contrast setting.) The whitewashed screen is the most common brightness problem. In order to get the best-looking colors out of your monitor, set your brightness to where there is no discernable difference between the black of the monitor glass and a black object on your screen.

**Resolution.** The resolution of a monitor is measured by the number of pixels it can display. Resolution is expressed as a matrix of dots on the screen. For example, a resolution of 640 x 480 means that there are 640 dots (pixels) across the screen and 480 lines down the screen. Common resolutions are 640 x 480, 800 x 600, and 1,024 x 768.

The higher the resolution, the more you can view at a time on your screen, but this also means that the higher the resolution, the smaller things will look. You would not want to run a resolution of 1,024 x 768 on a 14-inch monitor; you would need a magnifying glass to read anything on it. Typically, you will find that bigger monitors, such as those that are 17 inches or larger, work best with a higher resolution such as 800 x 600 or 1,024 x 768.

If you are having trouble viewing your monitor because everything is too small, try



**The Device Manager and the Upgrade Device Driver Wizard can both make updating your video driver in Windows 98 and 2000 a much easier process.**

changing the resolution. This is easy to do: Right-click a blank space on the Desktop and choose Properties from the pop-up menu. In the Settings tab, slide the marker in the Screen Area section to the resolution of your choice.

■ **Extenuating Circumstances.** If you have tried all the suggestions here, and the

images on your monitor still aren't as sharp as you would like, the problem could stem from something as simple as your video cable. The combination of high refresh rates and lots of graphical data make the monitor cable a busy place. These cables are special shielded cables built to reduce interference from outside sources and provide the optimum signal to the monitor.

When we mere mortals try to improve on a highly engineered piece of equipment, sometimes we tend to create more trouble than we mean to. This is often the case with monitor cables. When you need your monitor cable to reach beyond its normal length, you rush out and buy an extension cable. Unfortunately, the addition of a marginal-quality monitor extension cable can easily cause signal degradation, which in turn shows up as blurry or fuzzy images on your monitor. Marginal cables can also cause a doubling or ghost image to appear. The solution?

Buy a high-quality monitor extension cable. Or better yet, remove the extension cable and relocate your PC closer to your monitor. **ES**

by Keith Schultz

## Terms To Know

**Anti-glare**—A process of treating the glass on the monitor to cut down on the amount of light it reflects. Glare can cause eye-strain and headaches. Common anti-glare techniques involve optical coating, tints, and filters.

**CRT (cathode-ray tube)**—The display screen used in standard computer monitors.

**dot pitch**—Measured in millimeters, this is the distance between adjacent phosphor dots of like color (red, green, or blue) on the screen. The closer the dots are together, the sharper the image and the finer the dot pitch. High-quality monitors typically have a

dot pitch of .25mm or less.

**Interlaced**—To display an image on your monitor, the electron guns in a CRT display scan the screen from top to bottom, left to right. Interlaced monitors scan every other scan line. On the first pass, they scan the odd lines; on the next, the evens. Interlaced monitors typically will have a noticeable flicker because each screen refresh requires two passes.

**LCD (liquid-crystal display)**—A flat, lightweight display technology used in calculators, digital watches, notebook PCs, and desktop PC monitors. Special molecules in the screen have the

ability to bend and twist light to create desired images.

**noninterlaced**—Monitors that scan every scan line on the way down. This reduces flicker and only requires a single pass for each screen update, so it's preferred to an interlaced monitor.

**phosphor**—A chemical compound that forms the coating on the inner face of a CRT monitor. When struck by the monitor's electron beams, it glows to create an image.

**pixel**—The smallest part of an image that a computer printer or display can control. An image on a

computer monitor consists of hundreds of thousands of pixels, arranged in such a manner that they appear to each be connected. Each pixel on a color monitor comprises three colored (blue, red, and green) dots. The term comes from the words picture element.

**resolution**—The amount of definition and clarity in an image on a monitor. Resolution is measured by the number of pixels the device can display.

**refresh rate**—The rate in cycles per second (Hertz) at which the screen is redrawn. For flicker-free operation, refresh rates over 72Hz are recommended.

## Go To The Heart Of Your PC To Improve Its Performance

**W**hen searching for ways to maximize a computer's performance, the solutions that usually come to mind first are upgrading hardware or adding software. But in many cases, the first thing you should do is make sure your computer is set up properly for the best possible performance. The place to start is at the heart of your computer: the motherboard's BIOS (Basic Input/Output System). The BIOS is software that controls the ways your computer's hardware interacts with your software.

Computer manufacturers usually set the BIOS to the most common or "safest" configuration for each motherboard (the printed circuit board that is the foundation of a computer). This allows manufacturers to use the same BIOS in many different systems. The trade-off for consumers is that if the BIOS isn't configured for their particular system, their computer will never be able to work at its full potential. Fortunately, BIOS settings aren't permanent. In many cases, a little tinkering on your part can result in a smoother-running system.

Because every BIOS is a bit different, you may not have some of the items we mention, they may not be listed in the same order, or they may have slightly different names. Don't worry about the differences. Combined with any documentation you have for your computer's BIOS, this article should include enough information to let you make the changes needed to maximize your system's performance.

■ **How To Access The BIOS.** You can access the BIOS when your computer starts by pressing a specific key or key combination. The keys most commonly used to access the BIOS are: DELETE, ESC, CTRL-ESC, CTRL-ALT-ESC, F10, and F2.

When the startup text begins to display on your screen, your computer will list the name of the BIOS at the top of the screen. The instructions concerning which key or key combination to press to enter the BIOS setup program are usually displayed near the bottom of the screen.



Push the appropriate key quickly, because you only have a short timeframe in which to access the BIOS setup program. (If you miss it, you can always restart your computer.)

Before you start exploring, here are some words of caution. The changes you make to the BIOS can enhance the performance of your computer or prevent it from booting (starting up). Before you change anything, write down the default settings for any item you plan to change. Keep this information handy, in case you need to return the entries to their original values.

### ■ Navigate The BIOS Setup Program.

With most BIOSes, you use the arrow keys to move between items. You will probably use the ENTER key to select items to change and the PAGE UP and PAGE DOWN keys to change the value of an item by making a selection from a predefined list. Every BIOS includes a legend near the bottom of your screen that describes the function of each key. If you're not sure how to make a change, check the legend for information.

BIOS setup programs are organized in pages; each page contains related settings. For

example, a Standard or Main page might contain settings for the date and time, as well as the hard drives on your system. You can move from page to page to make desired changes to your BIOS. Some BIOSes use the ESC key to move to the previous page or back to a table of contents that lists all pages. Other BIOSes use a tabbed display; the arrow keys move you from one tab to the next, with each tab corresponding to a specific BIOS page.

### Speed Up The Boot Process

One of the first set of tweaks to perform is to decrease the time it takes for your system to boot. Manufacturers usually configure BIOS factory settings to support a wide array of hardware, even if you don't have that hardware on your computer. These blanket settings cause the BIOS to perform unnecessary system tests or setup routines. Eliminating some items, or changing the startup tests your BIOS performs, can speed up the boot process.

■ **Drive Settings.** You can usually find the settings for your hard drive, floppy diskette drives, and CD-ROM drive on a page labeled Standard Setup or Main.

Your hard drives will be labeled as Primary Master, Primary Slave, Secondary Master, and Secondary Slave. Each will have a TYPE entry; typical choices include: AUTO, NONE, USER, CD-ROM, ZIP, MO (Magneto-Optical), LS-120, Other. Selecting AUTO will cause the BIOS to scan the IDE (Integrated Drive Electronics) bus to see if there is anything attached to it.

If the BIOS finds anything, it will determine the type of device and then automatically set up the required parameters for its use. If you know there is no device connected to a specific IDE bus position, select NONE from the TYPE options. This will prevent the BIOS from wasting time searching for devices at that location. If you know the IDE device is your CD-ROM or any of the other entries listed, make the appropriate selection; this will speed up the boot process. If the IDE device is your hard drive, we recommend leaving the setting on AUTO to ensure the BIOS will detect and correctly set up your hard drive. You should generally avoid the USER setting. This setting lets you manually enter specific parameters for all hard drives, but in most cases, this information isn't available to you. If you enter the wrong data, your hard drive may



become unavailable or may be severely restricted in performance or available disk space.

If you aren't sure what, if any, devices are connected to each IDE bus, you can find out by setting the selection to AUTO, then saving and exiting the BIOS setup program. Your computer will then reboot. As the BIOS runs through the configuration process, it will display on your monitor the HDD (hard disk drive) devices it detects for each IDE position. Note the device found at each position, then reboot and make any needed changes to the hard drive settings in your BIOS.

You will also see entries for two floppy drives. If you don't have a floppy drive connected to your computer, set the selection to NONE. Otherwise, the common setting is 1.44M, 3.5 in. If you have a different type of floppy drive connected, select it from the list.

**■ Boot Up Floppy Seek.** The Boot Up Floppy Seek searches for a floppy drive during the boot process. You may have noticed your floppy drive making noise when you first turn on your computer; the Boot Up Floppy Seek causes this noise. If the Boot Up Floppy Seek detects a floppy drive, the test will also determine whether it's a 40-track or 80-track floppy drive. Because 40-track drives haven't been used for many, many years, this test is unnecessary and wastes time.

The most common location for this item in the BIOS is either the BIOS Features Setup page or the BOOT page. Once you find it, select Disabled.

**■ Quick Power On Self Test.** Another way to increase boot speed is to restrict the number of self tests performed when you boot your computer. You can usually find the Quick Power On Self Test on the BIOS Features Setup page or the Boot page. When you find it, set it to Enabled and note where it is for later use. If your system ever becomes unstable, you can return to this item and disable it so that your computer will perform a full power on self test. You might also want to do this when you make major changes to your system, such as adding or replacing memory or adding new video or sound cards. Once you run your system a few times with the full test and everything seems stable, you can set the Quick Power On Self Test option back to Enabled.

That wraps up the basic changes for making the boot process faster. Before moving on to the next section, make sure any changes you've made so far work for your computer. Remember, you can always set values back to their original settings if you run into any trouble.

## Speed Up System Performance

The next group of tweaks will ensure you get the best possible performance from your computer. Along with performance, you also want stability, so we've noted any items that could potentially cause your system to behave less reliably. If your system behaves badly after making any of these changes, return the settings to their original values.

**■ Memory Settings.** Memory settings are usually located on a page called BIOS Features Setup, Advanced, or Chip Configuration.

**CPU Level 1 Cache.** This setting controls whether your processor's on-board memory

cache is used; the setting should say Enabled. The only time you should disable it is when you are troubleshooting problems with your processor, or if you have an older processor that doesn't have a Level 1 Cache.

**CPU Level 2 Cache.** This setting controls whether the processor's secondary memory cache is turned on or off; the setting should say Enabled for most systems. Some older computers shipped without Level 2 Cache, so if you turn this on and your system becomes unstable, change the setting back to Disabled.

**CPU Level 2 Cache ECC (Error-Correcting Code) Checking.** Some Level 2 Cache memory can check itself for errors every

## BIOS Resources

**K**eept the documentation for your BIOS handy when you make changes to your system. If you can't find the manual, it may be

available online. Each BIOS is customized by the motherboard manufacturer or by the computer manufacturer to meet their specific

needs. If you can't find information about your BIOS from the following sources, try contacting the BIOS manufacturer.

**Motherboard manufacturers.** If you don't see your motherboard listed here, try the Motherboard Home World Web site (<http://www.motherboards.org>) for manufacturer lists and links to manuals.

### ABIT

<http://www.abit-usa.com>

### AOpen

<http://www.aopen.com>

### ASUS

<http://www.asus.com>

### Biostar

<http://www.biostar-usa.com>

### DFI

<http://www.dfi.com>

### EpoX Computer

<http://www.epox.com/html/english/default.htm>

### FICA

<http://www.fica.com/main/main.stm>

### iwill

<http://www.iwillusa.com/home/home.asp>

### SOYO

<http://www.soyo.com.tw>

### Shuttle

<http://www.spacewalker.com/english>

### Tyan

<http://www.tyan.com>

**BIOS manufacturers.** Two of the most common BIOSes are now produced by one company, Phoenix Technologies. At the Phoenix Web site (<http://www.phoenix.com>), you will find information on both the AwardBIOS and the PhoenixBIOS.

Other BIOS manufacturers include AMI (American Megatrends; <http://www.ami.com>) and Microid Research (MR BIOS; <http://www.mrbios.com>).

**BIOS upgrades.** Like any other piece of software, your BIOS may occasionally

have updates available for it. Check with your PC and motherboard manufacturers for BIOS update information, or visit Unicore (<http://www.unicore.com>), a convenient resource for BIOS upgrades and other BIOS-related information.





time data is read from it, and it can even repair some minor errors it finds. This process adds a slight overhead to the time it takes to make any needed corrections, so some users who want fast performance disable the setting. We believe it's better to have slightly slower, correct data than faster incorrect data. If your Level 2 Cache supports ECC, we recommend leaving this setting Enabled.

**SDRAM configuration.** Most newer computers use SDRAM (synchronous dynamic RAM) instead of the older, slower DRAM or its variants. Your choices for configuring SDRAM are SPD (Serial Presence Detector), which uses the information stored on your memory's SPD chip to automatically configure memory timing requirements, and User Defined, which lets you enter this information manually. Some BIOSes also include preconfigured speed settings in their selections.

Memory timing settings can have profound effects on how fast, as well as how reliably, your computer operates. The safest setting, and the one we recommend, is SPD. This setting forces the BIOS to check the SPD chip on the memory card for the correct setting to use for that specific memory. The memory manufacturer programs this information into the SPD to ensure the best results and compatibility.

If you want to push your computer's performance to the limit, you can select the User Defined option and then enter your own values for the three timing items: SDRAM CAS (Column Address Strobe) Latency, SDRAM RAS (Row Address Strobe) to CAS Delay, and SDRAM RAS Precharge Time. Lower numbers mean faster access to the memory, but changes made here can cause system instability or boot failure. Changes made here can even prevent you from re-entering the BIOS setup program to undo any changes you made. Before you make any changes to this entry, be sure you know how to reset the BIOS to the factory default settings. You can usually do this by jumping a set of pins on your computer's motherboard or removing the battery. Be sure you know what you are doing before making any changes.

■ **Video Settings.** Video settings may be listed under Advanced, BIOS Features Setup, ChipSet Feature Setup, PCI Setup, or other similar names.

**AGP 4X Support.** This may also be called AGP (Accelerated Graphics Port), with a value (speed) of 1x, 2x, or 4x. The 2x level should be compatible with most AGP cards, but check

with the manufacturer of your AGP video card to find out which speed it supports.

**AGP Fast Write.** The Fast Write option lets your CPU write data directly to the AGP card for increased performance. If your video card supports Fast Write, enable this option.

**Video Memory Cache Mode.** Some newer video cards use a new cache technology called USWC (Uncacheable Speculative Write Combining). If your video card supports this feature, enable it for better performance. If your video card does not support Write Combining, enabling this setting may prevent it from displaying any video.

**High Priority PCI Mode.** This item gives preferred status to the add-on board plugged into the first slot of your PCI (Peripheral Component Interconnect) bus. If you are using a PCI-based video card or a PCI-based SCSI

(Small Computer System Interface) card, you may want to enable this function and plug your add-on card into the first PCI slot.

■ **Miscellaneous Settings.** Almost every BIOS includes items called Turbo, Turbo Mode, or Fast Turbo. The function of these settings is usually poorly documented, if at all. Because the BIOS and chip designers believe these features will increase performance (hence the Turbo moniker), enable these functions whenever you find them. Only enable one setting at a time, though, then save and exit the BIOS Setup and restart your computer into the Windows operating system to ensure your system is still stable. [S]

by Tom Nelson and Mary O'Connor

## Terms To Know

**AGP (Accelerated Graphics Port)**—A dedicated form of PCI (Peripheral Component Interconnect) bus. While the PCI bus can host multiple devices, the AGP has a single connector with higher performance, well suited to the needs of accelerated graphics cards.

**BIOS (Basic Input/Output System)**—A special piece of software that controls how your computer's hardware will perform, as well as how it responds to instructions from your computer's software.

**bus**—An interface that lets one part of a computer communicate with another part of the computer. A bus has two parts: a physical layer made up of wires to send and receive information, and a protocol layer that defines the form the information will take as it is sent or received.

**cache**—In terms of your computer's BIOS, cache

refers to the fast, dedicated memory contained within your CPU or on a dedicated cache bus attached to your CPU. Cache memory is a small pool of very fast memory that your CPU can access for frequently used data or instructions. Cache memory can speed up the performance of your system.

**chipset**—A collection of hardware functions integrated into one or more physical chips. Common chipsets include memory controllers, hard drive controllers, and expansion bus controllers.

**CPU (central processing unit)**—Also called the processor or microprocessor, the CPU is the device that performs the majority of the work in your computer.

**IDE (Integrated Drive Electronics)**—Originally an interface used to connect hard drives to your computer, it was later expanded to include support

for removable drives, CD-ROMs, and other storage options.

**motherboard**—The main circuit board of your computer. The motherboard contains the CPU, RAM, serial and parallel ports, hard drive interface, plus an expansion bus for additional add-in cards. Some motherboards also include additional devices directly on the board, including sound and video support.

**PCI (Peripheral Component Interconnect)**—A bus standard used on most current PCs for adding extra functions, in the form of add-in cards such as sound cards, modems, Ethernet cards, and graphics cards, to your computer.

**SCSI (Small Computer System Interface)**—A bus used for attaching hard drives and other peripherals to your computer.

DODGE BOMB. FIND PHONE. DODGE BOMB.  
DIAL NUMBER. DODGE BOMB. TRY TO DRIVE.



OR JUST USE THIS.



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**TIPS**

# Save Space On Your Computer

## Clear The Clutter From Your Browser, E-mail & Hard Drive



**T**he spacious expanse of hard drive that came with your computer is starting to feel cramped with scattered files, programs, and a wealth of computerized debris just begging to be dragged to the recycle bin. If you're like most computer users, you have your share of little-used data littering your hard drive. This not only makes organization difficult, it also slows down your system. Before you cave in and buy a larger drive, though, try some of these tips for clearing some space on the one you have.

■ **Clear The Browser Cache.** A browser cache is a folder that stores Web pages you have recently viewed. The cache is a useful tool because it offers quicker access to pages you view frequently. But, depending on the size at which you set the cache, it can quickly

bloat and take over a significant chunk of your drive, slowing your browser's performance. The other possible problem with the browser cache is that if you don't keep the files there up to date, you will be referencing old material instead of accessing new material from the Web.

To avoid these problems, it's a good idea to periodically delete your browser's cache. The following steps will show you how to do this in several versions of the Netscape and Internet Explorer browsers. All browsers use some form of caching system,

so if you use a different browser to surf the Web, check the browser documentation for instructions on how to flush its cache. In most cases, controls for setting the size of the cache will be located in the same area as those for clearing it.

**Netscape 3.x.** Select Options, Network Preferences, Cache. Click both the Clear Memory Cache Now and Clear Disk Cache Now buttons.

**Netscape 4.x & 6.** Choose Preferences from the Edit menu and select the Advanced option, followed by Cache. As in earlier versions of Netscape, click both of the Clear Cache buttons.

**IE 3.x.** Open the View menu; select Options, Advanced; and click Settings in the Temporary Internet Files section. Click Empty Folder.

**IE 4.x.** Select Internet Options from the View menu. On the General tab, click Delete Files in the Temporary Internet Files section.

**IE 5.x.** Select Internet Options from the Tools menu. Choose the General tab and click Delete Files in the Temporary Internet Files section.

■ **Clean The Browser History.** Clearing a browser's history (a log of sites you have visited over a certain length of time) can not only free up space on your hard drive, but it can also work as a security measure to erase the footprints indicating where you've been online. Like the cache, you can also use controls near where you clear the history to limit the size and scope of this feature.

**Netscape 3.x.** Open the Windows menu and select History, Expire Now.

**Netscape 4.x.** Select Preferences from the Edit menu. Choose the Navigator category and click Clear History.

**Netscape 6.** Select Tools from the Tasks menu and click History.

**IE 3.x.** Open the View menu and select Options, followed by the Navigation tab. In the History area, click Clear History.

**IE 4.x & 5.x.** Open the View or Tools menu and select Internet Options. On the General tab, click Clear History.

■ **Delete Cookies.** Remember when the word "cookies" conjured up images of Keebler Elves and glasses of milk instead of malicious hackers and the eerie feeling of someone peering over your shoulder as you surf the Internet? Cookies (files that Web sites place on users' hard drives) have been on the scene since the third version of both Netscape and IE. Cookies allow Web sites to personalize their content and remember your username and password, among other things.

The downside of cookies is that they give away more information about you than you may be comfortable with. In addition, they can pile up quickly and consume a lot of space on your hard drive. Deleting them will clear up some space, but you will lose your site preferences and have to register with a site every time you visit it. If you still want to proceed, follow these steps:

**Netscape (prior to version 6).** The easiest way to delete cookies in earlier versions of Netscape is to delete the Cookies.txt file. To find it, click Start, Find and choose Files Or Folders.

Netscape 6. Open the Edit menu and choose Preferences. Select Advanced Options, click Cookies, and then click the View Stored Cookies Button. This will let you view, edit, or delete one or all the cookies listed there.

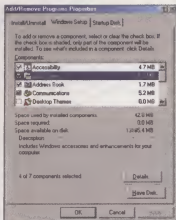
**IE (all versions).** IE stores all its cookies as individual text files in one location: C:\WINDOWS\COOKIES. Browse to this folder and then select which ones (or all) to delete.

**IE 6.** Microsoft is adding a Delete Cookies button to IE 6 (the next version of the browser in the works) as part of the General tab in the Internet Options dialog box.

■ **Remove Bookmarks/Favorites.** Bookmarks (Netscape) or Favorites (IE) are a good way to quickly access your favorite sites, but they can build up fast. Occasionally weeding them out is a good way to both regain space and improve your browser's performance.

To manage Bookmarks (Netscape), either access the Bookmarks menu or choose Bookmarks from the Windows menu. Depending on your version, you'll see such options as Go To Bookmarks, Manage Bookmarks, and Edit Bookmarks, which will lead you to a section where you can delete specific Bookmarks you no longer need. In IE, Bookmarks are called Favorites. To delete Favorites you no longer use, access the Favorites menu and, as in Netscape, select the appropriate area (such as Organize Favorites) for your browser version.

■ **Clear & Archive E-mail.** E-mail is probably one area that you don't think about when it comes to saving space on your PC, but e-mail can quickly take up a lot of room on a hard drive. It's a good idea to minimize



**The Windows Setup tab of the Add/Remove Programs Properties dialog box lets you easily install or uninstall such Windows components as Desktop Themes and Communications programs.**

lets you compress messages you don't have a pressing need for. In this way you can hold onto messages while still conserving space.

■ **Disk Cleanup.** If you'd rather minimize the amount of time you spend scouring your hard drive for files to delete, Disk Cleanup is the application for you. This program ships with Windows and can help to keep both Internet-specific and other files at a manageable level. You can also use it as an easy way to access other tools that can help trim up your hard drive, such as the Add/Remove Programs Properties dialog box, which we'll talk about in a moment.

1. Access Disk Cleanup by clicking Start and selecting Programs, Accessories, System Tool, Disk Cleanup. In the Select Drive dialog box, choose the drive you want to clean. The application will now calculate how much space it can save before opening the Disk Cleanup dialog box. The actual setup and number of options available to you will depend on your system.

2. In the Disk Cleanup tab, you will see a number of different file types you can clean up, including Temporary Internet Files (another way to access and clean your browser cache),

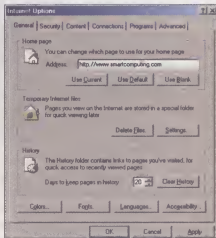
your e-mail collection to free up space.

Delete any e-mail messages you don't need, paying particular attention to those messages with attachments. Attachments can include any number of file formats, including large files such as pictures, music, and movies.

Check your e-mail program documentation to see if the application has an archiving feature built into it. For example, in Microsoft Outlook, you can access this feature by choosing Archive from the File menu. Archiving mail

Downloaded Program Files (ActiveX controls and Java applets that are downloaded as part of Web pages), the Recycle Bin, and a Temporary Files folder option, where some programs store temporary information. Depending on your system, other options may be available, such as the ability to delete offline Web pages and debugging information.

3. To get a description of an option, highlight it and the description will appear, clearly enough, in the description window. When you click a box to select it for deletion, the total amount of disk space you will save by cleaning out those files displays as a running tally below the Files To Delete window. Some options, such as Temporary Internet Files, feature a View Files button that lets you actually crawl into a folder and see what you will be deleting before you do it.

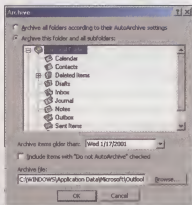


**You can set and manage cache and history options in Internet Explorer 5.x through the Internet Options dialog box.**

4. Click the OK button at the bottom of the box to delete any checked items.

Another tab common to most Windows systems with Disk Cleanup is the More Options tab. Select this for one-click access to various sections of the Add/Remove Programs Properties dialog box (see next section), where you can add or remove Windows components, regular installed programs, and more. Again, various systems, such as Windows Me, offer additional options here, such as access to the System Restore application.

■ **Remove Programs.** In addition to accessing the Add/Remove Programs Properties dialog box from the Disk Cleanup program, you



**E-mail applications such as Outlook have an archive feature that lets you save little-used mail in a compressed format.**



can launch it by clicking Start and selecting Settings, followed by the Control Panel. From the Control Panel, double-click the Add/Remove Programs icon to open the Add/Remove Programs Properties dialog box. Here you will see a couple of different ways to regain some significant space on your hard drive:

**Install/Uninstall tab.** From the Install/Uninstall tab, you can completely remove software on your system. Simply click a program from the list to select it and then click the Add/Remove button. The program does a pretty good job of removing most aspects of an application, although you may have a little cleanup to do afterward. Be careful in deleting any DLL (dynamic-link library) files, as more than one program on your system may be using these and tossing them could force you to reinstall other programs that share the DLL.

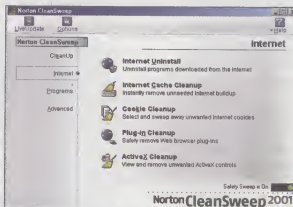
**Windows Setup tab.** The Windows Setup tab can also help you free up hard drive real estate. The Components window holds all the parts of Windows on your computer. These parts are organized into such sections as Accessories, Communications, and Multimedia. Each section can hold several different components, and you can see a list of components by highlighting a section and clicking the Details button.

Sections that are shaded only have select components installed. This is noted in the description box, where you can also get details on the section itself. The area between the Components and Description windows keeps track of how much space components take up, how much will be added or removed if you follow through with the installation or removal options, and more.

You can uninstall certain components by highlighting a section and clicking the Details button. Then in the window that pops up, remove the check mark from the checkbox in front of the component you want to remove. If there is no check mark, that component is not installed. Click OK when you're done, then click OK again to exit out of the Add/Remove Programs Properties dialog box.

**Uninstall option.** Another way you can remove programs is by clicking any uninstall option a program has. You can find this by browsing through the specific program folder or by clicking Start, selecting Programs, opening up the folder containing the specific program you want to remove, and seeing if an uninstall icon is part of the Start group.

**Delete Temporary Files.** Your computer uses the Temporary Files folder as a temporary storage area when it installs applications. Many applications will clear out their garbage at the end of the installation process, but not all are so courteous. This folder can balloon out quickly with files that have no purpose, and until you delete them by hand, they aren't going anywhere.



Applications such as Norton CleanSweep give you a break by doing all the work of cleaning your system for you to save space and increase system performance.

1. To clean out the Temp folder, shut down and restart your system, then open the C:\WINDOWS\TEMP directory. (You can access the C: drive by double-clicking the My Computer icon on your Desktop.) Your system may be using some of these files, but if you try to delete them, you'll be prompted/warned.
2. Sort the files by date and drag anything older than a week to the recycle bin. You can also check to see if you have a C:\TEMP folder and run it through the same process.

#### Get Rid Of Miscellaneous Files.

In addition to all of the above, try the following to free up disk space: Check to see if files you have unzipped are still lurking around your hard drive in .ZIP format. Often when you decompress a file, your computer will not delete the original compressed version; you'll have to do that yourself manually.

Start by searching for multimedia files. Formats such as .AVI, .MOV, or .WAV represent movie and sound files that can take up a lot of

space. You can search for these files by clicking Start, selecting Find, and choosing Files Or Folders. In the Find: All Files dialog box, click the Advanced tab and choose the appropriate file type from the Of Type drop-down list.

**Cleanup Software.** Of course, if you'd like to save yourself some of the hassle of searching all of these disposables out yourself, you can always have third-party software do it for you. A number of specialized applications do a great job of easing the task of hard drive cleaning, but two of the best are Window Washer and CleanSweep.

**Window Washer.** Webroot.com's Window Washer (<http://www.webroot.com>) not only cleans up Internet files such as browser caches, cookies, and drop-down address lists, but you can also use it to keep the Recycle Bin, Temporary File folders, and more in check. Special features of the program let you clean custom files that you specify and give you the ability to overwrite deleted files so file recovery utilities can't be used to recover any information.

**CleanSweep.** Think of Norton CleanSweep (<http://www.symantec.com/sabu/qdeck/ncs>) as an industrial-strength cleaning crew. In addition to Internet and run-of-the-mill drive files, CleanSweep can clean up the Registry. It can also remove programs and their associated files and find and delete redundant DLL files, duplicate files, and much more. One nice feature here is the ability to back up and restore anything you do, letting you repair any mistakes you stumble into with a simple click.



The Disk Cleanup application already on your computer makes it easy to delete several different kinds of files.

#### Every Day Can Be Cleaning Day.

Performed frequently, these simple disk-cleaning techniques will help keep your hard drive clean and lean and make your system and applications run better and faster. Who could ask for more? ☐

by Rich Gray

**TIPS**

# Startup Process

## Speed Up Your PC's Go Time With These Pointers



It's one thing to set aside half an hour every morning to perhaps shower, eat breakfast, and maybe even go for a run, but if you are doing these things to kill time as you wait for your computer to get up and running, it's time to do some work on your startup process.

From the time you first push the power button to the moment the final icon winks into view on your screen, your computer performs a number of tasks: Applications load in the background; virus utilities scan your files; and hardware, Registry, and other files are polled and checked, to name just a few. The startup process is quite a bit more detailed than you might think, but it shouldn't last so long that you fall asleep waiting for it to finish.

You can probably trim a fair amount of fat out of your startup process to greatly speed it up. Try some of the following tips to make your "morning routine" a bit less cumbersome.

■ **Clean Out The StartUp Folder.** One of the biggest time-drains at startup is the loading

of stray bits of applications that like to hang out in the background, waiting to be used. Applications such as Microsoft Office and Real Networks' RealPlayer are notorious for pre-loading little pieces of themselves so that when you first use them, they will load all the faster. Unfortunately, they add to startup time and, many feel, needlessly cut into your total available operating memory. You can find and get rid of the most obvious of these items in the StartUp folder.

To access the StartUp folder, click Start and select Programs. Right-click the StartUp folder and select Open from the pop-up menu. Right-click anything in this folder that you don't want your computer to load or don't really use that often and select Delete from the pop-up menu. Don't worry about deleting something you may need later; these are all shortcuts, not the actual programs. If you decide a few days down the road that you miss a particular program or piece of a program that had been loading at startup, find it in the Recycle Bin on your Desktop, right-click it, and select Restore from the pop-up menu to put it back in the StartUp folder.

Alternately, you can drag any shortcuts you want to remove from the StartUp folder to a special folder that you create. Then if you want to return a shortcut to the StartUp folder, you can easily drag it from the folder you created to its original location in the startup lineup. Or instead of placing the shortcuts in a different folder, you can place them in the Quick Launch section of the Taskbar. This way they are close at hand, but they don't needlessly take up valuable resources.

Another way to keep your StartUp folder free of time-consuming clutter is to keep an eye on the installation of any new software. You can usually short-circuit software's attempts to add to the StartUp folder at this point.

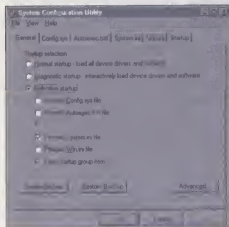
After you've made the changes you want to the StartUp folder, reboot your computer to make the changes take effect.

■ **Use The System Configuration Utility.** Unfortunately, you won't find all the applications and bits of programs that load at startup in the StartUp folder. The StartUp folder contains some of the most obvious startup items, but it is not the only source for such items; rather, it's usually just the tip of the iceberg. You can find many more startup bits, pieces, and programs using the System Configuration Utility.

To open the System Configuration Utility dialog box, click Start and select Run. Type msconfig in the text field and click OK. In the System Configuration Utility dialog box, click the Startup tab. Everything that is checked here loads at startup. If you don't want something to load, uncheck it.

Sounds simple, but how do you know which items you need and which you can ditch? The list of items that can appear here is long and will vary according to your system and installed software. You can find a fairly large list of possible items that will help you identify things in this dialog box at <http://www2.whidbey.com/djdenham/Uncheck.htm>. A search for a file name on a search engine such as Google may also help. You can also try to track the individual items down on your hard drive and get whatever information you can either based on its location or by

- In Windows 9x, click the Selective Start-up radio box and uncheck the Process Config.sys File and Process Autoexec.bat File checkboxes. These load DOS drivers and other environmental variables and generally aren't necessary.



For Windows 9x systems, you can short-circuit the loading of DOS drivers and other environmental variables by unchecking the Process Config.sys File and Process Autoexec.bat File checkboxes in the System Configuration Utility dialog box. This will help speed up the startup process.

- In Windows Me, click the Selective Startup radio button and uncheck the Load Environmental Variables checkbox.

When you've finished making changes in the System Configuration Utility dialog box, click **Apply**, then **OK**. If you made any

changes, you should be prompted to restart, which you should do. If you notice your computer seems to be a little "off" or performing poorly, undo what you did and reboot, then try redoing them one at a time and rebooting to see if you can hone in on the problem area.

**Quit Checking For Floppy Diskette Drives.** Every time you start your computer, the system checks to see if there are any new floppy diskette drives it should know about. This has a certain usefulness for portable computers but is probably something you don't need on a desktop system. Removing the instruction that causes your system to check for floppy drives on startup will not only make your computer boot up faster, but it will also save on floppy drive wear and tear.

1. Right-click the My Computer icon on your Desktop and select Properties from the pop-up menu.
2. Click the Performance tab, then the File System button.
3. Under the Floppy Disk tab, uncheck the Search For New Floppy Disk Drives Each Time Your Computer Starts checkbox.

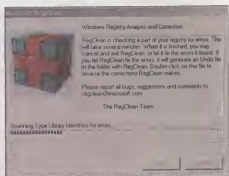
Disabling this feature will not keep you from booting your computer from a rescue floppy disk. You can still do this as usual by placing the rescue disk in the floppy drive and simply starting the computer.

■ **Disable The Auto Insert Feature.** You may find the auto insert feature (which lets audio and data CDs instantly launch when you place them in the CD-ROM drive) very handy. You might find it an annoyance. Either way, you can save a couple of ticks of startup time by disabling it.

1. Right-click the My Computer icon on your Desktop and select Properties from the pop-up menu.
2. Click the Device Manager tab.
3. Double-click the CD-ROM icon from the list and then double-click the icon for your CD-ROM drive (or the one you which you want to disable auto insert, if you have more than one installed on your system).
4. Select the Settings tab, then uncheck the Auto Insert Notification checkbox and click OK.

■ **Clean Up The Registry.** You probably have at least a passing familiarity with the Registry. This Windows area is where configuration values, settings, and other information for

all your applications reside. When you install an application, information in the form of keys is written to the Registry, and when you remove the application from your system, the uninstaller program (or third-party uninstall solution) will remove this data from the Registry. Well, that's what is supposed to happen.



Microsoft's RegClean is one of several programs that can check your Registry for obsolete or incorrect entries and then fix them.

In reality, it doesn't always work that way. Stray remnants of data can and do build up, causing the Registry to grow over time. Because the Registry loads at startup and is stored in RAM, the larger the Registry is, the slower it will load and the more RAM it will consume. Finding an easy way to remove entries that are obsolete or incorrect or just point to a nonexistent application can shrink the Registry and, as a result, your startup time.

A number of different software solutions can help you in this situation. Programs such as Microsoft's RegClean (<http://support.microsoft.com/support/kb/articles/Q1477/69.asp>), Easy Desk Software's Perfect Companion (<http://www.easydesksoftware.com/index.htm>), and Symantec's Norton Utilities (<http://www.symantec.com/nl>) let you check your Registry against programs on your computer and clean out unnecessary information. A couple of things to keep in mind before using these solutions:

1. Make sure you back up a copy of the registry before changing it. Changing the wrong key in the Registry can lead to big problems, particularly if you don't have a copy to fall back on.
2. Restart to make all changes take effect.

■ **Adjust The Root Directory.** Another area you might consider cleaning to speed up your startup process is the root directory (if you boot to your C: drive, it will be the C:

directory). A lot of extra files can collect here, and getting rid of any garbage that's collected in this folder can only help both your boot-up and your overall system performance. There are some things to keep in mind before messing around in this folder, though.

1. What you can delete here will vary greatly from system to system and will vary depending on what you've installed in the past.
2. Deleting anything here can be dangerous. A lot of files here, if removed, will keep you from booting your system at all, which is why the next point is so important.
3. Back up any file before deleting it and make sure you have a bootable system or rescue floppy diskette.

■ **Tune The Msdos.sys File.** The primary job of the Msdos.sys file is to serve as a sort of startup pointer. Your system will look to this text file to find the Registry, boot drive, startup files, and more. You can manipulate several of the startup options in this file with a text editor, letting you do such things as speed up the startup system and remove the initial startup logo.

1. First, you'll have to find the file. Msdos.sys is a "hidden" file, so if your system isn't set to show it, you won't be able to see Msdos.sys.
  - a. You can set your computer to view hidden files by clicking Start and selecting Settings, Folder Options.
  - b. Select the View tab and make sure the Show Hidden Files And Folders (or Show All Files, depending on your system) radio button is selected.

- c. Click Apply, then click OK.

2. Now that you can see the Msdos.sys file, double-click the My Computer icon on your Desktop and open your boot drive (probably C:). The Msdos.sys file should be in this folder.

3. Right-click the File and select Properties, then uncheck the Read-only and Hidden checkboxes in the Attributes section.

4. Make a backup copy of the file. Then open Msdos.sys in a text editor such as Notepad (Start, Programs, Accessories, Notepad).
5. You can manipulate a number of different settings here, but the one that will most directly effect your boot time is the Bootdelay line. This line sets the time interval that Windows will wait after displaying the Starting Windows screen to let you get into the Boot Menu Screen.

- a. Change the setting to zero (the default is two). In the future, this just means that, if you have to hold down a key such as F8 to get into the Boot Menu Screen, you'll now have to be pretty quick to do it. Every other startup you'll be rewarded with a boot time that's two seconds quicker.
- b. Save Msdos.sys.
- c. Reboot for the changes to take effect.



**In order to change the Msdos.sys file, you'll first need to enable the Show Hidden Files And Folders option (or the Show All Files option, depending on your system).**

system and boot times are not unduly taxed.

You'll need to shut down real-time scanning from within your antivirus software. (You can't just uncheck the program in the Startup tab of the System Configuration Utility dialog box.) How you perform this operation will vary from program to program, but the following will walk you through the process for Norton AntiVirus 2000.

1. Open Norton AntiVirus by clicking Start and selecting Programs, Norton AntiVirus. Click the Norton AntiVirus 2000 icon.
2. Click Options from the Menu bar.
3. Select Auto-Protect from the list along the left side and uncheck the Start Auto-Protect When Windows Starts Up checkbox.
4. Click OK. To shut down Auto-Protect for the current session, click the Disable button under System Status.
5. Remember to set up scheduled scan times, because your system is now wide open and unprotected.

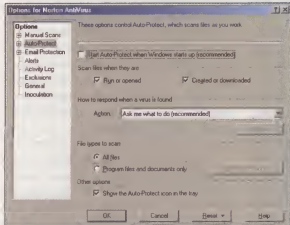
■ **Other Possibilities.** In addition to the above tips, here are a couple of other possible areas you can manipulate to speed up your startup time.

**Tweak your BIOS.** Depending on your system (and you; this is not for the faint of heart), you may be able to trim a little off your boot time by manipulating some features in the BIOS (Basic Input/Output System). These can include options for keeping your system from counting its memory when it starts up, enabling "quick start" or "quick boot" options, and more. See the article on page 78 for tips about tweaking the BIOS.

**Get a faster processor.** You can only tweak so much. While certainly not the inexpensive way to go, one sure way to speed up your startup is to upgrade to a faster processor.

■ **Less Waiting, More Computing.** Employ some of these tips, and you'll find yourself spending less time waiting and more time computing. You may also find that your system itself runs noticeably faster and smoother. [E]

by Rich Gray



**You can set antivirus programs such as Norton AntiVirus so that real-time scanning for viruses doesn't tax your startup time or system performance.**



# TIPS

# Drivers

## Keep Your System Safe & Alert

**E**very device you add to your PC connects in two ways. The first is the physical connection, such as a USB (Universal Serial Bus) cable or a PCI (Peripheral Component Interconnect) slot. The second is via a driver, a small piece of software that acts as a translator between your PC and the device. When you give a command to print a document, the text and formatting commands are meaningless to the printer until a driver intervenes and tells the device how to implement the instructions and data. This is why one document output to the same printer twice may look different if separate drivers are used on each job.

Many users are content to take their new PCs out of the box and never give drivers a thought. However, drivers can become corrupted over time. Installing new hardware may cause driver incompatibilities. As your configuration changes, you may want or be forced to modify your present drivers. Dealing with drivers is a regular part of computing, and you'll be better off meeting the challenge head-on with some of our top driver tips.

### Cover The Basics

Think of drivers like you think of any other PC component. They need regular care and servicing. Sometimes they go bad and need to be replaced, and other times you may just want to upgrade them for better performance. Here are some of the essentials for making sure your designated drivers stay safe and alert.

■ **Keep current.** It's not enough to install your drivers and forget about them. Responsible vendors don't stop driver development for a product as soon as the device is ready for sale. Companies like Hewlett-Packard and Intel continue listening to user feedback and watching the evolution of surrounding hardware. Usually it becomes clear that modifications are needed in the original driver, either to enhance functionality or increase compatibility. This is why you need to make a habit out of periodically checking the support pages for each of your PC's main component/peripheral vendors and seeing if a new driver has been released.



Many vendors now maintain mailing lists to alert users about such releases, and we encourage you to get on these lists. In our experience, good vendors will not provide your name to spamming solicitors if you give them your contact information.

Also take care to periodically run the Windows Update feature from the Start menu. This will take you to Microsoft's Update site. The routine scans your system and recommends, among other things, updated device drivers for your hardware. This is an invaluable free service that will save you massive amounts of time fishing around vendor sites.

■ **Are You Compatible?** Drivers are not only device-specific but also operating system-specific. The driver you would use for Windows Me may not be the same one you'd need in Windows 2000. In fact, your device may not even have a driver compatible with your OS (operating system). This crops up as a frequent problem for users looking to upgrade OSes. Win2000 supports far fewer devices than Windows 98 and WinMe. Be extra careful if you're considering moving to a non-Microsoft OS, such as Linux. Alternative OSes lack the massive

industry support Windows enjoys, and you may find upon installing your new OS that half of your peripherals have been rendered useless. To see if support exists for your hardware under a given version of Windows, check Microsoft's Windows Hardware Compatibility List Web page (<http://www.microsoft.com/hcl/default.asp>).

■ **Got Issues?** You can't address problems unless you know what they are. Make a point of checking your Device Manager, either as a point of maintenance or as an early procedure in the troubleshooting process when you notice hardware problems. This is where Windows alerts you of driver problems. In Windows 95, Win98, and WinMe, right-click My Computer, select Properties, then click the Device Manager tab. In Win2000, use the Hardware tab, then click the Device Manager button.

Here you'll see a list of all the devices in your system, each of which has a plus (+) key to its left. Clicking the plus opens a tree showing the device driver for that item. If one of these devices shows an exclamation point in a yellow circle, this usually notes some kind of driver conflict, where the hardware either can't find a suitable driver or the existing driver isn't functioning properly. Double-click the conflicting item to display its properties. Choose the Driver tab, then click the Uninstall button. When you reboot, Windows will attempt to reinstall the driver, hopefully sorting out any resource conflicts along the way. If you've downloaded a new driver for the device, you may need to point Windows to the location where you saved the new file. Otherwise, you may need to provide the driver disk that accompanied your hardware.

### Advanced Tricks & Issues

Now that you've got the basics of driver maintenance covered, know that there are some advanced tricks and stability issues you should practice. Usually, the object with drivers is just to get a device working at its peak capacity, but sometimes this can backfire if you're too hasty.

■ **Avoid Beta Drivers.** Software engineers have a hard enough time guaranteeing that their final release drivers are 100% stable. Prerelease versions, usually called beta versions, are only recommended for experienced users who know how to correct software glitches when they arise. The term beta implies the software still has bugs that are being worked out, and this applies as much to an entire OS as a small driver file. You may be tempted to run beta drivers for the extra features they promise, but fight the urge unless your existing driver is already causing problems, in which case you have little to lose.

■ **Keep It Real.** Until recently, there has always been the risk that downloaded driver files might be corrupted or incompatible with your system. Beginning with Win98, Microsoft implemented File Signature Verification to help minimize this risk. The process uses digital signatures, a secure means of verifying data authenticity, to establish that your system file is unaltered and/or approved by Microsoft. To access the feature:

1. Click Start, select Programs, Accessories, System Tools, and then click System Information.
2. In the Tools menu, click Signature Verification Tool. (Win2000 users will go to the Tools menu, and then click Windows, then File Signature Verification Utility. Or click Start, Run, and then type `sigverif` in the box.)

When you download driver files from third-party sites, Windows may alert you that you're attempting to obtain a file that has not been verified by Microsoft. You'll need to use your judgment here. Top-name vendors like ATI or Creative Labs should be safe.

■ **Ease Your New Driver's Installation.**

Some drivers have trouble installing if similar drivers are already active. When you go in through Device Manager (see above) to replace a device driver, be sure to uninstall the old driver first. You may need to reboot the system for the new driver to take effect. Some drivers are very finicky about installation, particularly those for sound and video cards. If you find the new driver is not working and you're positive it's the correct one, uninstall the driver through Device Manager. Reboot the PC and press the F8 key during the boot sequence—usually about the time the system configuration box displays on-screen—to view your boot options. Select Safe Mode. This puts you into a special Windows state where only the most minimal drivers load.

Install your new driver in Safe Mode, then reboot again.

■ **Fake A Printer.** Many applications require a print driver to be present in Windows in order to operate normally. For example, a scanning and document storage application might require a printer driver in order to convert scans from raw images to an output-ready format. The software may not be picky about which printer driver is installed, so if you don't currently have a printer connected to your system, at least install a generic driver. Here's how:

1. Click Start, select Settings, then click Printers.
2. Double-click Add Printer. When the Add Printer Wizard appears, click Next, select Local Printer, and click Next again.
3. Printers default to using the LPT1 port, but in this case scroll down the Use The

Following Port list and select Print To File, then click Next.

4. One of the most generic drivers around is the HP LaserJet. Select HP from the Manufacturers list on the left then HP LaserJet from the Printers list on the right, and click Next.
5. Leave the printer name as HP LaserJet and select Yes to make this your default driver, then click Next. Since this is a "dummy" driver, select Do Not Share This Printer, then click Next.
6. Skip the test page. Click Next, then Finish.

■ **Safe & Sound.** With the pointers listed here, along with regular maintenance, your drivers should remain in good running condition for a long time. [E]

by William Van Winkle

## Those Vexing VxDs

Many Windows 3.x and Windows 95 users are well acquainted with VxD (virtual device driver) files—or the lack thereof. The acronym actually stands for Virtual "something" Driver, where the something is a component in your system.

These files are essentially device drivers for the OS (operating system), letting the OS manage multiple requests for the same hardware resources, imitate the presence of actual hardware, and many other core system functions. As such, if key VxD files are missing or corrupted, your entire system could come to a standstill. Many Windows users have faced OS reinstallations or even reformatting in the face of VxD errors.

Microsoft has made great strides in reducing the number of VxD-related problems since Win95, but difficulties persist. The number of VxD errors you might get is voluminous, and the error itself might not clue you into the

source of the problem. For example, users with Pentium III CPUs and Creative Labs SoundBlaster Live! cards running Windows 98SE may receive the following message: "Error in EMU1.0 1K".

At most, this is a VxD problem. Downloading the latest Creative Labs SoundBlaster Live! driver will cure the problem. Similarly, several UMAX and Genius scanners had a driver conflict with the USB (Universal Serial Bus) driver in Windows 95/98 (Win9x) that resulted in a VMM32.VXD error.

Part of pinning down a VxD-related problem hinges on taking careful note of "where" the error occurs, meaning what system address or device the error is associated with. For some examples of specific driver errors see Techadvice.com's site ([http://www.techadvice.com/w98/Errors\\_vxd.html](http://www.techadvice.com/w98/Errors_vxd.html)). Once you know the device(s) related to the problem, you can narrow your search for more current drivers that

might fix the trouble.

One very common error is to get notification of a missing or damaged .386 or VXD file referenced in the SYSTEM.INI file. While it's probably true that the .386 or VXD file (these are really the same thing, the former being for Win3.x and the latter for Win9x) is damaged, you may hunt forever in the SYSTEM.INI for the problem. More likely, the file is being loaded either in the Windows registry or by VMM32.VXD.

The bad news is that you'll need to identify the corrupted driver (it should be referenced in the error message) and reinstall it. The good news is you don't need to look beyond your original Windows CD for a replacement copy. Go to Microsoft's article at [support.microsoft.com/support/kb/articles/Q12/9/6/05.ASP](http://support.microsoft.com/support/kb/articles/Q12/9/6/05.ASP) for specific directions on how to extract specific files from your program disc. ■



# Connections

## Get Connected For The Most Optimal Performance



For most users, Windows' networking capabilities are an essential aspect of their computing experience—they make it possible for us to browse the Internet, receive and send e-mail, download files, and connect to other computers.

Because networking is so important, many users learn more about it than any other aspect of Windows. If you are one of these users, you probably know what speed your modem is, and you have heard of such concepts as Dial-Up Networking and TCP/IP (Transfer Control Protocol/Internet Protocol); the "language" of Internet connections. You may also have experienced the frustration of disrupted connections or molasses-like downloads.

Here's the good news. While troubleshooting a network or Internet connection can be a major pain in the patootie, tweaking one for optimum performance is not. In addition, many of the leading efficiency-enhancing

"tweaks" will also reduce the chance of connection problems occurring in the future.

Some of these tweaks involve minor changes to the system; some employ third-party utilities. Taken individually or as a whole, these enhancements will give you a cleaner, faster network and a better understanding of how the system operates.

### *Dial-Up Performance Tips*

If you're like the vast majority of Internet or remote networking users, you rely on a modem and a dial-up connection. If you consistently connect at 40Kbps (kilobits per second) or higher (56Kbps modems) or 26Kbps (33.6Kbps modems), there is not much you can do to increase connection speed. Phone lines are limited by government regulations to 53Kbps, and even this speed is impossible without a near-perfect connection.

With that in mind, even if you are connecting at a top speed, your computer may not be

processing the information as efficiently as it is receiving it. This is especially true if you are using a newer modem on a computer that is more than a year or two old. These tips will help increase your connection speed if it is slow, make the most of it if it is fast, and even help you stay connected once you are there.

■ **Check Modem Settings.** If during setup, you chose a generic modem rather than the actual one in use, it can affect your connection speed and efficiency. Make sure your modem manufacturer and model are correct.

1. Click the Start menu, select Settings, then click Control Panel.
2. Double-click the Modems icon.
3. When the Modems Properties dialog box papers, check to see if your modem's name exactly matches the documentation that came with it. If your modem came preinstalled without documentation, the settings should be fine. If they look suspicious, such as a generic modem or Hayes-compatible modem, you may have to open your computer and check the name printed on the modem card.
4. If the modem name does not match your equipment, contact your modem manufacturer to obtain the latest driver and follow the instructions in the next tip to update it. If the modem name does match, do not close out of this window, but instead skip to the tip titled Check Your Modem Speed.

■ **Update Your Modem.** Call your modem manufacturer or visit its Web site to obtain the latest modem information files (noted with the .INF file extension). If updates are available, obtain them (remembering where you store them—a folder on the Desktop is always a safe bet) and reinstall your modem using the new files.

1. From the Start menu, select Settings, and click Control Panel.
2. Double-click the System icon.
3. When the System Properties dialog box opens, click the Device Manager tab.
4. Double-click Modem (or click the plus [+] key next to Modem), right-click your modem, then click Properties. On the Connection tab, write down the information given under Connection Preferences area. Also click the Port Settings and Advanced buttons and write down the information in each of those dialog boxes. Under the Resources tab, document the Resource Type information. Retain this

information in case you need it later. Then click the OK button.

5. If you have a new .INF file, click the Remove button. (NOTE: There is no cancellation option for this step. Do not remove your modem if you do not have an installation diskette/disc or updated information files on hand.)
6. Close the window and double-click the Modems icon.
7. When the Install New Modem Wizard begins, click the checkbox next to Don't Detect My Modem; I Will Select It From A List, then click Next.
8. Next, click Have Disk, then use the Browse option to navigate to the point in your system where the new modem files are stored. Click OK.
9. Follow the prompts through to finish the installation, using the same settings as your old modem.
10. When you restart the computer, Windows will update your modem and files.

**■ Check Your Modem Speed.** Windows has a maximum speed setting in Modem Properties. It reflects the port speed—the highest rate at which your computer (and its programs) can communicate with your modem, and not the speed of your modem itself. Troubleshooting routines often suggest users reduce this speed, even though it may not be the source of the problem.

To maximize your throughput (the efficiency with which data is transferred), the port speed should be set higher than your modem's maximum rated speed. (If problems occur, reset it to its original setting. Also, if you connect to services with very slow transmission rates, such as Telnets-based bulletin boards, you may have to reset the speed in order to connect successfully.) To change this setting:

1. From the Start menu, select Settings, then Control Panel.
2. Next, double-click the Modems icon.
3. In the Modems Properties dialog box, click your-modem's name and then click the Properties button.

4. Be sure the General tab is selected and look for Maximum Speed at the bottom.
5. If your modem is 56Kbps or 33.6Kbps, then change the maximum speed to 115200 in the drop-down list. Users of 28.8Kbps modems should use 57600. If connection problems occur, reduce it by one setting.

If your highest setting is 19200, you have an old UART (universal asynchronous receiver-transmitter) chip in your computer. These chips control communication between the serial port and the computer. You will not be able to realize the full potential of the fastest dial-up modems. Do not proceed with this exercise if this applies to your system.

6. Next, click the Connection tab. Then click the Port Settings button. Make sure Use FIFO Buffers is checked. Drag both Buffer slider bars all the way to the right. Click OK, then Close.
7. Restart the computer in order for changes to take effect.

**■ Update Your Browser.** Each successive generation of Internet Explorer and Netscape has offered greater efficiency as well as fixes to problems and security leaks that have been discovered. If you are still using an older version, upgrade to the latest one (assuming your computer will support it). For Netscape, go to <http://home.netscape.com/browsers>. Be sure to download 6.01, which includes fixes for the somewhat buggy 6.0. For IE, visit <http://www.microsoft.com/windows/ie>. Users will find IE5.5 also includes important patches.

**■ Check The Connection Number.** Ask your ISP (Internet service provider), especially if it is a Web-based provider, to see if your dial-up number is really a local call. Some ISPs forward your local call to a remote location to provide service, so you are not actually dialing a local server. This can degrade the quality of the connection and slow it down. If the call is being forwarded, ask for a local server number or

**■ Check The Line Connection.** See if you have a clear connection when you plug a phone into the same phone line you are using for your modem connection. If not, replace the line.

**■ Disable Additional Devices.** Occasionally, connecting external phones or answering machines to the extension jack on your computer's modem can affect modem speed and operation. If you want to run a phone or answering machine and modem on the same phone line, buy a two-line extender at your local hardware store and insert it at the phone interface.

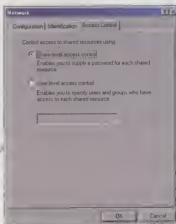
If your computer accepts incoming faxes or remote connections, you may have problems using an answering machine on the same line as the computer. You should install voice-messaging software on your computer and use it for incoming messages.

**■ Disable Call Waiting.** If call waiting is installed on your phone line, you should disable it to avoid possible termination when another call comes in. To ensure call waiting is off:

1. Open the Start menu, select Settings, then click Control Panel.
2. Double-click the Modems icon.
3. When the Modems Properties dialog box opens, click the Dialing Properties button.
4. Click the checkbox that says To Disable Call Waiting, Dial: and choose the appropriate option in the drop-down list. In most instances, this will be \*70. If you are not sure, check with your phone company.

**■ Disable Automatic Termination.** If you have an unlimited Internet connection plan and want to stay connected to the Internet even if you leave the computer for a few minutes, you can prevent your modem from terminating the call after a certain amount of time passes without any user input. This can be especially important if you perform downloads, which may be assigned an idle status by the computer. To disable automatic disconnection:

1. From the Start menu, select Settings, then Control Panel.
2. Double-click the Modems icon.
3. When the Modems Properties dialog box opens, select your modem's name and click Properties.
4. Click the Connection tab and make sure the Disconnect A Call If Idle For More Than button is not checked.



As a precaution, those who use a network to share files and access the Internet should password-protect their shared resources by enabling Access Control under Network Properties and then specifying a password for all shared resources.

tion and slow it down. If the call is being forwarded, ask for a local server number or



This will not prevent your ISP from disconnecting you for the same reason. If you are having problems with disconnection during downloads, contact the ISP directly and see if you can increase your idle time settings.

### Network Performance Tips (Internet & Network Connection)

If you are lucky enough to have a network connection to the Internet (cable or DSL [Digital Subscriber Line]) or you operate a local-area network within your home environment, you should have minimal trouble with your connection. There may be a few things you can do to improve its efficiency, however.

**■ Be Consistent.** If you are operating a Peer Network (where two or more computers share files or resources, such as printers or broadband connections via cabling and network cards), you will have the best performance if all your computers use the same type of card. If either or both of the computers came with a pre-installed network card, check your documentation to see if they are the same model and speed. If not, consider upgrading the lesser card to match the better one. (Most network cards are inexpensive, costing less than \$50.)

### ■ Check TCP/IP Packet

**Sizes.** TCP/IP clumps data into packets to send it across phone or network lines. The MTU (maximum transmission unit) of the Internet is 576. If your packet sizes are set to a higher standard, they will be broken down and reassembled, slowing transmission efficiency. Windows 98 and Windows Me automatically "read" the connection and set the packet size to Small (576) for connections under 128Kbps; Large (1500) above it.

If your network connection is faster than 128Kbps, the Automatic setting may be too high for efficient Internet access. If you use your network connection primarily to access the Internet, set the packet size to 576. (If this appears to degrade network performance substantially, change it back to Automatic.)

1. From the Start menu, choose Settings, click Control Panel, and double-click Network.
2. Click the Configuration tab. Next, click Dial-Up Adapter, then Properties.

3. On the Advanced tab, click IP Packet Size in the Property box. Then click the down arrow under Value to display the menu and choose Small.

**■ Set Limits.** This tip is more preventive than performance-enhancing, but it is an important part of securing your computer against outside intrusion if you access the Internet over a network.

If you have file sharing enabled on your network and have a permanent broadband connection (such as DSL or cable), you must password-protect the file sharing options or anyone on the Internet can access any of your shared files. This is particularly important if you are currently sharing entire drives, which we do not recommend.

6. Right-click the folder and select Sharing. Under Access Type, choose your desired share level and create the password. (Read-only lets users read and retrieve files; Full lets users delete or modify files.)

7. Copy or move the items you wish to share into the new shared folder on your Desktop.
8. If you are currently sharing drives, double-click the My Computer icon on your Desktop. Right-click the shared drives and select Sharing. Choose Not Shared under the Sharing tab and click OK.
9. Restart your computer so that the changes can take effect.

**■ Accept A Helping Hand.** Many users report the greatest improvement in Internet and network performance comes not from internal changes, but from installation of third-party utilities.

The top dog of these performance boosters is TweakDUN (\$15 shareware; <http://www.pattersondesigns.com/tweakdun>), which tweaks dial-up connections for speed increases of up to 40%, depending on your system.

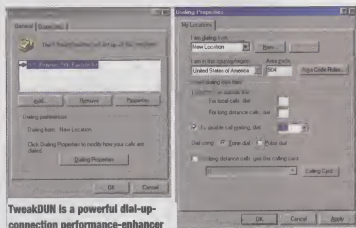
Another good choice for those who like to download files is a download manager, such as GoZilla! (\$39.95 shareware; <http://www.gozilla.com/>), which supports download

scheduling and can even restore an interrupted download.

Download sites such as Tucows (<http://www.tucows.com>) are filled with Internet, network, and e-mail utilities that can squash spam, streamline file transfers, automate searches, and more. Once you have got the basic tweaking down, you may want to expand your repertoire with some of these add-ons, many of which can really enrich your networking experience.

Networking is complex, but it does not have to be complicated. With a good grasp of the basics, plus the tips and helpers we have discussed here, both dial-up and network connections can become a trusted, and highly efficient, part of your total computing experience. **ES**

by Jennifer Farwell



TweakDUN is a powerful dial-up-connection performance-enhancer with an informative help feature.

Also, make your password difficult.

Don't make it the same as your name or the name of your computer. Make it something that a stranger cannot guess easily. To password-protect your files:

1. Click the Start menu, select Settings, click Control Panel, and double-click the Network icon.
2. From the Configuration tab, click the File and Print Sharing button to see if file sharing is enabled. (You can skip this step if you know that it is).
3. Next, select the Access Control tab and click Share-level Access Control to create a password for each resource. Then click OK.
4. If requested, insert your installation CD to install new files. When prompted to restart your computer, do not do so (yet).
5. Create a folder on your Desktop for file sharing. (Right-click the Desktop, click New, then Folder. Name it something like Shared Folder.)

**TIPS**

# Third-Party Utilities

## Improve Your System's Performance



expect from an unembellished system operating alone. Unfortunately, other programs masquerade as cure-alls but can actually cause more problems than they solve.

We want to help you wade through the sea of choices and decide which programs will be beneficial to you, given your particular system configuration. To that end, we have collected information on an armful of options billed as system "enhancers" of one variety or another. In this article, we will give you the scoop on the ones you must have and warn you away from the ones we (and many computer experts) think should be scrupulously avoided.

Some are free; others require a not-insignificant (less than \$50) purchase. Some are available in tandem with other related products, letting you realize a substantial discount (we explore some of those throughout this article). Which ones you want and can afford are up to you. Just remember, in the world of computers, the "free lunch" really does exist (as some of our choices prove), but it often comes with a hidden price. Money is no guarantee of quality. You can spend nothing and improve your system a little bit, or you can spend a lot and either tweak it to its ultimate conclusion or leave yourself with an unforgiving disaster.

In the area of system performance, many users wish there was a proverbial "silver bullet" they could fire at their computers and all the performance demons would be exorcised. Some look to third-party utilities and enhancement suites to provide this magical relief. Regrettably, just as there is no single solution to improving system performance by tweaking Windows or using its internal tools, there is no single third-party panacea, either.

There is, however, a collection of powerful programs and utilities that can provide you with a greater measure of data security and system performance than you could ever

All programs listed in the following pages support both Windows 98 and Windows Me unless otherwise noted.

■ **Enter The Good Guys.** There are three types of third-party utilities that you should consider purchasing if you are serious about system performance. These could be considered the "Holy Trinity" of system tools. Without them, not only will your system not perform at its best, but it might also at some point cease to perform at all. They are Virus Detection, System Cleanup, and Performance Optimization.

In the past, antivirus and system tune-up programs have been criticized for degrading system performance—basically slowing down system operations while doing its work. This problem has been minimized in recent years, but if your system is already strained for resources (such as running WinMe with the minimum processor and memory), you may notice a performance decrease. We submit that you are better off upgrading your computer than foregoing these enhancements. This is especially true of virus protection.

### Virus Detection

Viruses are a serious threat to computer users, especially those who browse the Internet. A virus is a program or applet with destructive or malicious intent (generally to destroy data or degrade system performance). It can only be attached to or activated by an executable file, such as a program file.

Because of this, many computer users assume that a virus must be run by the user, much like a program, before it can strike. This is no longer true. Thanks to macros and other automated routines such as the scripts used to drive the Internet, viruses can now be activated when a user opens a Word document, an e-mail attachment, or even a HTML (Hypertext Markup Language) e-mail (an e-mail message that looks like a Web page).

To make matters more confusing, many viruses do not immediately shut down your system. Instead, they worm their way around, causing minor, chronic damage and spreading themselves to other users with whom you share files.

For this reason, many computer experts consider a virus program to be the single most important third-party performance add-on for any computer user to own.

The three big boys of virus scanning are Norton AntiVirus, McAfee's VirusScan and Doctor Solomon's Anti-Virus. Each has its

defenders and critics. All three products offer online updates, an online virus information and support center, and round-the-clock virus monitoring and "code busting" by a team of virus experts. We will summarize each and leave you to decide which is best for you.

Whichever program you decide to purchase, plan to update it on a regular basis. A six-month-old virus program can be worthless against a newly minted virus, rendering your system susceptible to intrusion and damage.

**Dr. Solomon's Anti-Virus 8.5.** Part of the McAfee (<http://www.mcafee.com>) line of virus-protection products, Dr. Solomon's features basically the same options as VirusScan (outlined below) with one bonus—it works on 486 computers and requires only 10MB of hard drive storage space. It supports many e-mail clients, except for Netscape. It has no stated support for AOL, but AOL recommends it for its members.

Pricing: No free trial, \$29.95 to purchase.

**Norton AntiVirus 2001.** Developed by Symantec, a world leader in virus detection, Norton AntiVirus (<http://www.symantec.com>) is consistently the number one or two virus-protection program. It works in the background, scanning downloaded files, e-mail attachments, removable media such as floppy diskettes and CD-ROMs, and files stored on your computer. It can scan compressed files and it analyzes both ActiveX code and Java applets for potential problems.

The latest version features a wizard that assists users in sending infected files to the Symantec AntiVirus Research Center for analysis. It can also automatically update virus definitions and virus scan engines every time you connect to the Internet (free for the first year). This is a real plus for users who often forget to perform system maintenance, such as virus updates.

Norton AntiVirus will run on a 486 (pre-Pentium) processor, which is a blessing for users with older computers, and it is easy to install and operate. It supports the widest range of e-mail clients, including Netscape (Version 4 only), although there is no stated support for America Online. When you

visit its Web site, you can conduct a free online security check (<http://security2.norton.com>) to scan your computer for network vulnerability and the presence of viruses or Trojan horses.

Pricing: Free trial, \$39.95 if you decide to keep it. \$59.95 for Pro Edition, which includes protection for Palm devices and one year of free updates. Available as part of System Works (\$59.95).

**VirusScan 5.16.** Last year, McAfee's VirusScan (<http://www.mcafee.com>) toppled Norton's AntiVirus from its position as king of virus scanners. Like AntiVirus, VirusScan scans e-mail attachments, diskettes, system files, and Internet downloads. It also scans networks and shared files and analyzes Microsoft Word and Excel macros and Active X and Java applets to determine if they might contain malicious code. VirusScan supports many e-mail clients, but it does not support Netscape. It has no stated support for AOL, but AOL recommends it for its members. It reports a high rate of detection of AOL-borne viruses.

VirusScan is highly configurable, letting users enable or disable scanning features, and it incorporates a backup feature that lets users create a virus-free system backup without using external backup software. Unfortunately, VirusScan requires a Pentium-class processor, so users of older computers are out of luck.

In addition to its standard product, McAfee offers an online virus scanning service, whereby users pay a yearly fee for virus protection. With this service (which will run on a 486 processor), a virus scanning program is automatically installed and configured on a user's computer during initial

setup, and then the system accesses the Internet and updates the virus information files on a scheduled basis.

Pricing: Free trial, \$29.95 if you decide to keep it. \$24.95 per year for online edition, which is also part of McAfee Clinic (\$39.95 per year).

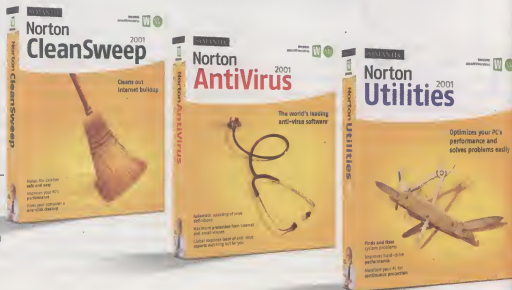
### System Cleanup

Over time, as we add and remove programs and hardware, change system settings, and perform other common operations, unneeded files, drivers, and Registry entries begin to litter the operating system like flotsam and jetsam after a shipwreck. To the average user it is impossible to differentiate these files from files that are required for system operation. To Windows, they can be more than unnecessary; they can be dangerous and disruptive.

The best way to eliminate orphaned files, drivers, icons, and shortcuts, fine-tune your system, and free up drive-storage space in the process is with a third-party system cleaning program. The two heavy hitters in this area, Norton CleanSweep and McAfee.com's Clinic Uninstaller Online, are similar in functionality, although each has features not found in its rival. The main difference between them, however, is that one is a software product you install; the other is provided via the Internet. A third contender, CleanKeeper, is an award-winning but little-known cleanup utility without Norton or McAfee's clout or price tag.

**CleanKeeper.** If you are on a budget, CleanKeeper (<http://www.cleankeeper.esmartweb.com/index.html>) will perform quick and efficient scanning of your hard drive and removal of extraneous files and

**Symantec's Norton line (shown here) offers virus protection, disk cleanup, and performance optimization products that can be purchased individually or as part of a system enhancement suite.**



empty folders. It works from a list of typical space wasters that can be safely removed. CleanKeeper is user-driven, which means you can edit the list of garbage file types and will always have final approval of files to be zapped.

By default, it is not as thorough as CleanSweep or Uninstaller, but if you know enough about file types to tweak it a bit, it will provide valuable cleanup functionality for a pittance.

Pricing: Shareware; \$15 if you decide to keep it.

**Norton CleanSweep 2001.** A good uninstaller program does more than remove unwanted files and their detritus; it safely eradicates Internet debris such as ActiveX controls, cookies, and Internet cache files as well. Symantec's Norton CleanSweep

.mcafee.com), a suite of subscription-based applications that users access online. Uninstaller enables users to remove, archive, move, and restore programs and their associated files. Uninstaller Online includes two bonus features—program archival and restoration and file elimination (multiple overwrite). It includes four separate applications:

- QuickClean to scan and remove temporary and duplicate files.
- Application Remover to remove unwanted applications and related files.
- Application Restorer to reinstall applications removed with Application Remover.
- FileWipe, which is designed to erase sensitive files and make them irretrievable by file-recovery programs.

Pricing: Part of McAfee Clinic, which is \$39.95 for a one-year subscription.

### Performance Optimization

This third category is perhaps the broadest of all, and encompasses several programs that perform a variety of tasks. Among them we have a utilities suite that will tweak your system for performance and at the same time guard against system crashes, an online service that will enhance your operation and make recommended driver updates to your hardware and software, and a bare-bones power twaker to modify your Windows zoom.

These programs overlap slightly in functionality, but they are not mutually exclusive. In fact, you

may realize the best performance gains by using more than one. (Actually, none of our programs are mutually exclusive, but duplication within the other two categories makes it less productive to purchase more than one program.)

The changes made by our three contenders, Norton Utilities, McAfee Clinic, and X-Setup, range from Registry tweaks to resolution of driver conflicts and installation of system patches. All of these operations can enhance system performance.

Whether they will make a difference in your system will depend upon how much maintenance you have done and whether you have been rigorous about following installation instructions and operating procedures. (The average user will realize a recognizable benefit from these power tools.)

Many technical experts have historically considered the free, power-tweaking utility developed by Microsoft, called Tweak UI, a must-have performance enhancer for Windows. However, it has not been updated for Win ME and Microsoft doesn't officially support it for Win98. Our third contender in this section, X-Setup, performs the same functions and has better support and documentation. If you are running Win98 and want to try Tweak UI, you can install it from the Win98 installation CD. Look under TOOLS/RESKIT/POWERTOY.

**McAfee.com Clinic.** We have already detailed the virus and disk-cleaning features of McAfee's online Clinic (<http://www.mcafee.com>) product in the previous two sections. Now, we will introduce you to its other two features—First Aid and Oil Change. First Aid performs functions similar to that of Norton Utilities, scanning your system for problems and conflicts, checking each component for optimal performance, and fixing potential problems automatically when possible.

Oil Change, on the other hand, is more of an updater. It takes a snapshot of your PCs hardware and software, then scans the Internet for updates, add-ons, and patches that could enhance system performance.



Both Symantec (shown) and McAfee maintain 24-hour labs where professional "virus fighters" work to isolate, identify, and eradicate new computer viruses.

(<http://www.symantec.com>) is one of the best at performing these functions.

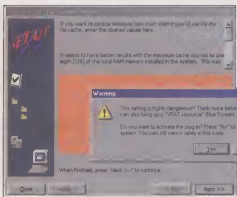
Originally developed by Quarterdeck Software, CleanSweep won numerous awards under its previous developer and is still a leader in system cleaning. It features an Uninstall Wizard to provide step-by-step guidance in removing old programs and their associated files. It is easy to install and configure, intuitive, and offers a good balance between caution and thoroughness. It won't let you remove anything it considers essential to the system, and it creates a backup each time it runs just in case it needs to restore files that have been removed.

Pricing: Free trial, \$39.95 if you decide to keep it. This is available as part of System Works (\$59.95).

**Uninstaller Online.** Uninstaller Online is part of the McAfee.com Clinic (

CleanKeeper identifies unnecessary files based on common extensions. Users can optionally delete them immediately, send them to the Recycle Bin, ignore them, or backup and then delete them.





**X-Setup offers wizards that step users through the process of identifying and executing beneficial system changes. Users can choose to configure the program to warn them of potentially harmful modifications or disable dangerous modules.**

through the possible changes step by step. X-Setup requires a substantial amount of user interaction and decision making.

To assist the novice user, it incorporates a comprehensive help file and useful links to online resources, plus a list of frequently asked questions and answers and an online user forum.

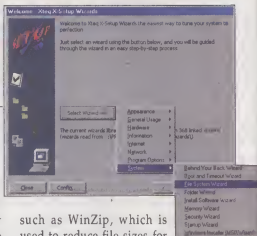
X-Setup's tweaks come in the form of modules, over four dozen of which are present in the program. Some of these modules make significant alterations and have the potential to reduce your system to mulch. Fortunately, the program incorporates security settings, which the user can enable by selecting Configure X-Setup under the X-Setup tab on the main screen. One setting causes warning dialogues to be generated whenever potentially harmful changes will be made, while the other disables the function but still lets users obtain information on it so they can research it for possible inclusion.

### The Ones To Watch

Now that you know the performance enhancers we think you should use, it is time to discuss the ones that perhaps you should not. In this category are what we call "maximizers," or products that promise to give you more of something than you currently have. The two "somethings" that cause the most trouble are hard drive space and RAM.

■ **Hard Drive Compression.** Remember what we said earlier about the free lunch? Hard drive compression programs promise to give you more free hard drive storage space. Free is fine when you are talking about well-written utilities such as X-Setup, described above, or RAM Idle, another freebie we will discuss later in this section. But when it comes to free hard drive space, we say, "Spend your money on a larger drive instead." Another alternative is to sign up for one of the many free file-storage services on the Internet.

Disk compression programs work in much the same way as file-compression software



such as WinZip, which is used to reduce file sizes for transfer and storage. It performs its magic by altering the structure of your files so they consume less space, often by putting them into one large file.

The program creates a blueprint of the new archive, remembering what goes where. When you need a file, it accesses this blueprint and reconstructs the files you need. This is not such a bad idea for copies of individual files, or even folders of noncritical information. For entire drives, it is something we do not even want to contemplate.

More than one user has experienced a system or program crash while his files were compressed and discovered that the blueprint needed to restore them was lost or damaged. No blueprint; no files. Scary thought, huh?

In an effort to continue selling software, the manufacturers of these products have incorporated safeguards that are supposed to make it virtually impossible for you to lose important system files or data. Do not believe it. There is no such thing as "never" where computers are concerned. If you are about system performance and file integrity, do not install a hard drive compression program, no matter how enticing it might seem.

■ **RAM Maximizers.** These programs promise to increase your computer's random access memory, or RAM, rather than its hard drive space. They are a mixed bag. In general, programs that override Windows operation on-the-fly (which many of these do) have the potential to cause problems. Many of these applications steal memory from system operations or dormant programs and reallocate it for use in current operations. This can also be problematic if the memory in question is needed by the original operation after it has been reallocated somewhere else.

Both products provide detailed analysis reports that can teach you about system operation. In addition, First Aid offers users access to an online knowledge base for specialized problem solving. It also builds a technical support contact list based on your system configuration.

Pricing: Part of McAfee.com Clinic, which is \$39.95 for a one-year subscription.

**Norton Utilities 2001.** Symantec's Norton Utilities (<http://www.symantec.com>) is the granddaddy of system performance tools. It was available when Windows 95 was little more than a gleam in Bill Gates' eye. Today, it is still a market leader, and its aim is to keep PCs running at peak performance.

It can do this in two ways—by continuously running in the background, looking for operational problems and conflicts that could portend a system breakdown and/or by performing enhanced diagnostics when problems occur.

It organizes your hard drive for faster access and optimum efficiency, repairs file and system corruption that occurs within Windows, and generally ensures everything is running as it should.

Pricing: No free trial, \$49.95 to purchase. Available as part of System Works (\$59.95).

**Xteq X-Setup.** This far-reaching, free power tool for Windows can be used by itself or in tandem with either Norton Utilities (or System Works) or McAfee Clinic. Xteq X-Setup (<http://www.xteq.com/products/xset/index.html>) can zip through your system files, plus many third-party games and programs, like a John Deere tractor through an overgrown field, helping you mow down inefficient system settings and optimizing configuration files.

It offers two modes—Plug-in, which presents an Explorer-like display of the settings that can be altered, and Wizard, which lets you choose an area of the system and walk

With that said, however, we must admit that a few of these memory maximizers seem to do a good job of snatching unused memory. Our two picks are FreeMem Pro and RAM Idle, both of which have won industry awards. Try one of these if you wish; if you decide they are not improving the situation, you can uninstall them without damaging your system or files.

**FreeMem.** The FreeMem (<http://www.meikel.com/en/freemem>) product comes in a free version (FreeMem Standard) and a paid version (FreeMem Pro). Both versions work by reallocating memory that is not in use anymore but has not been released by Windows or the program that was using it. It does this by taking the memory and filling it with dummy data, then removing it. This causes Windows to return it to the general memory "pool."

This is supposed to happen automatically, but it does not always work, and that is where FreeMem steps in. It is the safest memory maximization routine you can use. It does not tamper with memory that is temporarily free but may be needed for ongoing operations.

The standard version has limited memory-checking functions and doesn't allow user customization or interaction. The paid version is full-featured and includes the ability to specify which applications should be given more memory if possible.

Price: Free to try; \$19.95 for all the features.

**RAM Idle.** The RAM Idle program (<http://www.tweaknow.com/ramidl.html>) works in much the same way as FreeMem, but it recovers RAM that has become unusable or fragmented during system operation. The user can specify the amount of RAM recovery (three levels) and the intervals for RAM recovery.

If you like RAM Idle, the company also makes a shareware performance utility, Customizer 2000, that you may want to try.

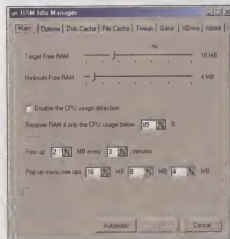
### Choose A Tool

Now that you have been introduced to a broad range of performance enhancing tools and utilities, you will need to decide which ones to use and in what combination.

■ **A Suite Deal?** As you may have noticed, we have mentioned two products in this article that are available in suites—McAfee's Online Clinic and Symantec's Norton System Works. While McAfee's product is accessed

online and Symantec's is installed in traditional fashion, both share one characteristic. They are designed to be comprehensive cure-all solutions for your system performance needs.

By purchasing them, you realize a substantial savings over the individual products. You also gain access to products or services that are not sold individually. (For example, Norton System Works includes Norton Utilities, AntiVirus, and CleanSweep, plus a Web-based security assessment tool and Norton Web Services, a software and hardware update service. It costs \$59.95. You can upgrade to System Works from any Norton product for \$39.95. McAfee Clinic includes McAfee VirusScan, Uninstaller, First



**RAM Idle enables users to decide what their minimum RAM availability levels are, how much RAM they want to recover, and how often the operation should be performed.**

Aid, and Oil Change. It costs \$39.95 per year to subscribe.)

Does this mean you should purchase a suite? That depends on your needs and your system capabilities. Suites automate many functions and make it easier to optimize your system, but they can also slow your system down if it is not robust enough to handle all the background activity. (This is especially true of software-based suites, like System Works.)

Before you purchase any of the suites, we recommend you try some of the individual products. You may find that you like McAfee's VirusScan but prefer Norton Utilities. You may also find that you enjoy the control that comes with individual products as opposed to an integrated suite.

■ **Online Or Off?** Another consideration, at least among our Good Guys, is whether you should use an online service or traditional software. An online service is generally easier to use and requires less configuration, but it involves a yearly subscription for continued service. It also means that if your Internet connection goes down, your ability to update your system goes with it. Offline software is just the reverse—you will retain more control, but more responsibility as well.

In general, online services and traditional software perform equally well, and McAfee and Symantec are well-matched in terms of quality. The choice is mainly a matter of personal preference.

■ **Before You Leap.** Even though these products are designed to improve your performance and system stability, before you install any of them, it is important that you take proper precautions.

1. Back up your system Registry and familiarize yourself with the procedures for restoring it. Consider exporting it to a separate data file. (See the "Windows 98/Me" tips article on page 56 for further instructions relating to the Registry.)
2. Back up important data files. (A portable drive, such as a Zip, makes quick work of this operation. If you do not have one, an online file-storage provider can be a great solution if your Internet connection is fast enough to handle the file transfer.)
3. If you are running WinMe, use System Restore to back up your system to the point of the installation. System Restore creates a file, called a Restore Point, that contains the Registry and other critical system information that you can restore in the event of system failure. System Restore runs from System Tools, which is located on the Start menu under Programs, Accessories.

With your initial choices made and your backups done, you'll be ready to start optimizing. Don't be afraid to try a number of options, either. Finding the tools that not only give a boost to your system but also a boost to your self-confidence about its operation is the key to making third-party utilities work for you. ☐

by Jennifer Farwell

# Set Sail With E-mail

**Y**ou are probably well aware that e-mail is often dubbed the killer app of the Internet. This likely makes perfect sense to you because you know how convenient and easy it is to use e-mail to keep in touch with family and friends or to send a resume and cover letter to a prospective employer. What you may not know, however, is exactly how popular e-mail has become.

A recent study by industry analysts IDC (International Data Corporation) found that Internet surfers are sending more than 10 billion "non-spam" e-mails per day, and that number is slated to more than triple in five years: By 2005, users will send an estimated 35 billion e-mail messages daily.

In this section, we'll look at e-mail today and at how it is driving the technology of tomorrow. We'll examine two popular e-mail clients, Eudora Pro and Outlook Express, and discuss some e-mail related issues such as security, spam, and legal rights. Finally, we'll explain how to use several different aspects of e-mail, such as sending video and voice messages, opening and sending attachments, e-mail netiquette, and using e-mail with your PDA (personal digital assistant).

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Save Yourself!
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Watch Your Messages . . . Your Boss  
Probably Does

# Follow The Leader

## E-mail's Big Wins & How It's Driving The Development Of New Technology

**E**-mail: It's everywhere you want to be. At work, at home, and on the road, people are accessing their e-mail all the time. More e-mail messages are now sent than telephone calls, according to Net400, and e-mail usage shows no signs of slowing down. In 1995, 400 million e-mail messages were sent worldwide each day, according to the Email Usage Forecast and Analysis, 2000 to 2005 report by Mark Levitt of IDC (International Data Corporation). By 2000, that number had jumped to 9.7 billion, and the report predicts it will reach 34.6 billion by 2005. These numbers leave little reason to wonder why e-mail is often considered the Internet's "killer application."

We'll look at e-mail's role in technological developments on the Internet and some of the software, hardware, and Web sites you can expect to see as part of this advancement.

■ **E-mail Leads The Way.** Because so many people use e-mail every day, it's easy to understand why e-mail is driving much of the technological development on the Web. For instance, consider the most recent release of America Online, version 6.0. One of the most-improved areas in this latest version was e-mail: AOL 6.0 carried a major upgrade of the e-mail client, including better HTML (Hypertext Markup Language) compatibility, clickable links to Web sites, and more formatting options, among other features.

For another example, you need only look at what online marketers are up to. A Feb. 26, 2001 Forrester Research report shows that as banner advertising becomes increasingly

ineffective, online marketers have begun turning to e-mail to get their message to consumers. As e-mail becomes more capable of advanced technology, the messages marketers can use become increasingly flashy and attention-grabbing.

**Rich media.** Of course, e-mail on its own can't bring about technological advances. It needs users who are willing to learn about and use these technologies in their everyday communications. Rich-media messaging is a good example. While people still send plain-text messages, users are increasingly sending messages with audio and video files. As these types of files make their way around the Internet, it's only natural that people become more familiar with them,

and they begin sending them more often. This leads to greater familiarity, which leads to greater volume of rich-media messages, and the cycle continues. Developers then see a larger market and put their energies into audio and video technologies.

"E-mail is helping to foster the growth, acceptance and use of streaming media type products, both audio and video," says Steve Koenig, a senior analyst with NPD Intellect in Reston, Virginia. He adds that this goes hand in hand with media players being built in to computer operating systems. Users of older systems such as Win95 and the older Macintosh operating system are not as likely to use these technologies.

**Getting personal.** Shar VanBoskirk of Forrester Research says that e-mail is also responsible in part for steering the development of customization technology. Online marketers often have several databases; one will contain customer data and another will contain, say, inventory details. In order to send personalized e-mails with customized data to their consumers, marketers face the challenge of connecting the two databases. (For instance, they may want to advertise an abundance of a product to a group of consumers who live in a certain part of the country.) So companies such as BoldFish work on developing technologies that can integrate multiple databases.

"The preliminary to rich media is customization," VanBoskirk says. "As companies figure out how to really relate to customer interest, we're seeing varying levels

of sophistication."

**A wireless world.** But the big technology behind which e-mail seems to be a major force is wireless. Robert Mahowald, a senior research analyst at IDC, says that e-mail and unified messaging are clearly





driving the development of wireless technology. And the lines between e-mail and instant messaging are becoming blurred. (See the "Other Ways Your PC Lets You Communicate" sidebar.)

"If you look at what's going on in the wireless world, it's pretty clear that messaging is (like e-mail on the Internet) the real 'killer app,'" says Sean Carton, of Web marketing and development company Carton Donofrio Partners. "Unfortunately, most of the interest on wireless has been based on WAP [Wireless Application Protocol]... big mistake. I think that once the world recovers from its WAP fixation, we'll realize that most of the wireless usage by normal consumers (and, in many ways, by business users) is going to be driven by messaging-based applications."

As for what's going on out there today, e-mail is still fairly practical; it's primarily a way to communicate. But advancements make the communication flashier, more secure, more commercial, and more widespread, especially as more people use wireless devices. Here's an overview of some of the newer developments in e-mail-related software, Web sites, and hardware access options.

#### ■ Software To Spice Up Your E-mail.

First there was text e-mail. Then came HTML. Now there's rich media e-mail: e-mail that delivers sound, animations, streaming video, and other multimedia right to your inbox. You usually don't need to have special software in your e-mail client to receive multimedia-enhanced e-mail; you'll just need to be able to receive HTML and see Flash animations.

Most consumer e-mail clients, including Outlook, Outlook Express, Eudora, AOL, and Netscape Messenger, let you see HTML mail. And increasingly, these e-mail clients have the Flash plug-in built in. If your client doesn't have Flash, you can download it at <http://www.macromedia.com/software/flash>. You'll also need an Internet connection speed that supports the animation and video that rich media can deliver. In other words, the higher the connection speed, the better.

**Eye candy.** Companies who have caught on to the fact that rich-media messages capture the attention of consumers better than plain-text messages have started

developing their own proprietary technologies for delivering rich media via e-mail. Streaming Media is one such company. You can take advantage of the progress they've made in this area by visiting their site (<http://www.streamingmedia.com>) and viewing its tutorials that show you such things as tips and tricks for creating streaming media that looks good on the Internet and a look at the underlying technology behind streaming media compression.

Interactivebyte, a rich media marketing company based in Canada, has also done some innovative work. You can see this for yourself by heading to the Web site (<http://www.interactivebyte.com>) and clicking a link at the bottom of the page to send yourself an.bbyte.

## Terms To Know

**IMAP (Internet Message Access Protocol)**—IMAP, like its less sophisticated counterpart POP3, is a protocol that tells your e-mail client and its server how messages will be retrieved. But unlike POP3, when IMAP looks at mail on the server, it simply views a message and notes the heading and sender information and then decides whether to download the message. The IMAP protocol seems to be replacing POP3.

**MIME (Multipurpose Internet Mail Extensions)**—A specification for attaching non-text files, such as graphics and spreadsheets, to an e-mail message.

**POP3 (Post Office Protocol 3)**—POP3 is a protocol that tells your e-mail client how to retrieve e-mail from the e-mail server, which is typically located at your Internet service provider's premises. POP usually works with Simple Mail Transfer Protocol (the

earlier version, POP2 required SMTP, but POP3 can be used with or without.) The e-mail messages are first sent to and held by the server, and POP3 tells your computer how to check for the messages and then to automatically download them to your PC. Once downloaded, they are no longer stored on the server.

**Sendmail**—No, it isn't a command from your PC. Sendmail is a popular UNIX-based implementation of the SMTP for transmitting e-mail. (UNIX is an operating system widely used by universities and mid-sized businesses, and it is more popular for workstation computers on networks rather than individual PCs.) Sendmail receives e-mail, attempts to deliver it, and holds it if the recipient isn't available. And, since it also is limited in its ability to "line up" messages, it works with software such as POP or IMAP.

**Now that's incredible.** Rich-media technologies can be considered a class of technologies in that they have applications in a wide range of programs. A few of the noteworthy newer technologies, however, are standalone programs.

One such example is IncrediMail (<http://www.incredimail.com>). A lighthearted, fun piece of software, IncrediMail is the closest thing to a revolution in e-mail that we've seen in a while. IncrediMail goes well beyond the use of emoticons to offer you the ability to tailor your e-mail messages to your moods and personality. It's like the difference between saying "Happy Birthday" to your neighbor and giving her a singing telegram.

A white-haired butler carrying a silver platter can present your e-mail message, if

**S/MIME (Secure Multipurpose Internet Mail Extensions)**—A standard that builds upon MIME and allows for encryption and/or adding digital signatures to MIME messages. S/MIME is an open standard, and it is included in the latest versions of Microsoft Internet Explorer and Netscape Navigator.

**SMTP (Simple Mail Transfer Protocol)**—SMTP is a protocol (which is a set of rules and procedures for exchanging data) used in sending and receiving e-mail over the Internet. Having a protocol means that two or more computers will be able to "speak" to each other. SMTP includes information on error checking and data compression, but since the protocol is limited in its ability to line up messages when they are being retrieved, it is often used in conjunction with either the POP3 or IMAP protocol.

you wish, or you can choose from among dozens of other notification characters. Cool 3-D effects, such as a paper flying through the air to land in your inbox, a shredder that is activated when you hit the Delete button, effects you create, and more, add pizzazz to messages. Backgrounds, animation, and sounds contribute a personal touch. Other special features include hand-written signatures, text effects, and greeting cards. IncrediMail has an online gallery where you can download the material you want to use in your messages.

**Business tools.** Zaplet Appmail is another program that demonstrates how e-mail technology is evolving. You may have heard about Zaplets in the past or even used them to check Web sites from within e-mail messages. Well, those days are gone. The company, Zaplet, has overhauled its consumer product and redesigned it as a business tool called the Zaplet Appmail Suite. The technology streamlines the process for making collaborative business decisions.

**Virus fighting.** Business is also driving the technological development of a popular, already established e-mail program: Microsoft Outlook. And it comes in response to "technology" that most of us wish didn't exist. Computer viruses exploded when the Internet gave them a quick, widely accessible path through which to travel.

Companies such as McAfee.com and Symantec have been developing antivirus software for years, but now one of the top e-mail clients is building antivirus capabilities right into its software. Microsoft recently announced that Outlook 2002, the e-mail application that is included in the new Office

XP business software suite, will have this feature. The software had not yet been released when this article was written (it's due out sometime later this summer) but developers have made it known that Outlook 2002 will reject a number of file types sent as attachments. These file types include program execution files, batch files, Java and Visual Basic scripting files, photo CD files, screensavers, and HTML application files.

This technology isn't completely new. Microsoft started cracking down on attachments after the ILOVEYOU virus hit the scene. It posted security updates to Outlook 97 and Outlook 2000 that controlled e-mail attachments, and last year it added a security update to the second Outlook 2000 service pack. What is new is how the technology is being implemented. Microsoft is no longer leaving it to the discretion

**Is the Delete button on your e-mail client too boring? IncrediMail adds cool special effects, such as running your e-mail message through the shredder.**

of its customers as to whether they want to enable the potential-virus blocking feature.

Not everyone sees this harsher step in the level of protection the suite offers as positive. Those who want to send legitimate executable files may be blocked from doing so, and some say this solution may lead to a false sense of security.

**Just for fun.** See any trends here? With the exception of IncrediMail, all the advancements covered above have been propelled largely by business concerns. But there are some nifty

**Sites such as Backwire can send out millions of unique, customized e-mail messages to its customers each day.**

utilities focused on the consumer market that you may not be aware of. Here are few of the more notable ones.

The Gammadyne Mailer from Gammadyne Software (<http://gammadyne.com>) is an e-mail automation utility. In other words, it lets you send personalized text and HTML to groups of people, and it automates some of the behind-the-scenes list management, such as handling sign-ups, unsubscribes, and bounced-back messages. Lyris and other utilities have been doing this for years, you say? Yes, but the newest version of the Gammadyne Mailer has some underlying technology that offers relatively new features, including command line control, which offers the ability to initiate a mailing from the DOS command line, and "conditional bodies," the ability to filter sections of the message based on database data. And it comes at a nice price; the shareware program is \$99.

MailTap is the creation of Karim Shehadeh at iWonder. MailTap, which debuted earlier this year, is a small but useful utility that will



## E-mail Attention: A Precious Commodity

As banner advertising becomes more ineffective and e-mail becomes an increasingly important part of people's lives, marketers are scrambling to get and keep users' attention. But as this chart shows, even rich-media laden commercial messages may have trouble competing against so many personal messages. This chart shows the amount of e-mail that each of the 1,287 respondents of a February 2000 survey received in 1999 and a projection of the number of e-mails each user will receive in the coming years.

	1999	2000	2001	2002	2003	2004	2005
Non-Work Related, Personal Marketing	1,746	2,059	2,420	2,758	3,094	3,511	3,990
	40	131	276	482	761	1,113	1,612

SOURCE: JUPITER COMMUNICATIONS

notify you when you have new e-mail in any number of accounts. It joins the class of several other new mail notification utilities, such as E-mail Announcer and GearVox. MailTap sits in your system tray, and when the new mail notification alert goes on, you just right-click the icon and choose the mail you'd like to read. You set the notification method and schedule. To download the free version,

head to <http://www.iwondercompany.com/mailtap/index.htm>.

If you're tired of wondering if your intended recipient ever got the e-mail you sent and even more tired of picking up the phone to call him and find out, you'll be glad to hear about this next product. A new group of products can track whether a recipient has received your message, and the

recipient won't even know. SentThere (<http://www.sentthere.com>) is one such product. You type in your message and the recipient's name and address, and the software will report when the message is opened. Granted, some of the more popular e-mail programs (such as Netscape Messenger) have showcased a similar feature, but in those programs, the recipient

## Other Ways Your PC Lets You Communicate

**S**ure, e-mail is a fantastic communication tool, but there are several other ways your PC lets you communicate with others. These include groupware, instant messaging, IP-based telephony, and videoconferencing. Here's a quick look at these applications.

**Groupware** does just what the name implies: It allows groups of individuals to share information. Users on a network can work together collectively, even though they aren't located in the same room. Groupware services often include calendars, contact databases, electronic meeting setups, e-mail, and other activities. Typically used on a company's private network (because of security reasons), it can also be used to connect to others across the Internet.

One of the most widely used groupware products is Lotus Notes, which is widely credited with introducing the concept of groupware when it was launched by Lotus Development Corporation in the late 1980s. Microsoft Exchange is another popular product, and it works in conjunction with Microsoft Outlook.

Like groupware, **instant messaging** also is appropriately named. With e-mail, users send messages back and forth, and they travel quite quickly, but the conversation doesn't necessarily happen in real-time. You can send an e-mail message that the

recipient doesn't open for a couple days, for instance. But with instant messaging, the messages go back and forth in a way similar to a phone conversation: one person speaks, the other person replies, and so on. Only in this case, rather than using a telephone, you're using your PC and special instant messaging software, and the conversation is typed rather than spoken.

Most instant messaging programs let you set up some type of buddy or contact list that notifies you whenever one of your contacts logs on. You usually click the individual's name, type a text message in a box, and send the message on its way. The person with whom you're instant messaging then receives your message and types one of her own. The whole "conversation" is displayed on your computer screen, and some programs let you save the conversation to a text file.

Instant messaging software is usually free to download and use. AOL offers a product called AOL Instant Messenger. Other popular programs include Yahoo! Messenger, ICQ (pronounced "I Seek You") from Mirabilis, and Microsoft's MSN Messenger Service. One of the drawbacks of instant messaging is that many programs do not let you share messages across platforms. Both users must subscribe to the same service.

This isn't always the case with **IP telephony**. IP (Internet

Protocol) telephony lets you make telephone calls through your computer to a telephone or another computer. (It also lets you make phone-to-phone calls, without even involving a computer, but we'll focus on the computer aspect here.) The caller, whose computer is equipped with a microphone, speakers, and sound card, uses special software to dial the recipient's telephone or computer. Once the connection has been established, the caller speaks into the microphone, and the voice data is broken into packets. It travels over the Internet or other IP-based network instead of over the standard telephone wires (also called POTS [Plain Old Telephone Service]).

Unlike POTS, IP telephony doesn't need a dedicated line to carry the call. This means that the line you're using for the call may be carrying other packets of data, such as e-mail you're shipping to a colleague or material you're downloading from a Web site. Because the line can carry more traffic, IP telephony calls are usually much cheaper than traditional calls. The trade-off, though, is that IP telephony calls may be of poorer quality.

You have many options for IP telephony software. Some notable companies include Net2Phone and iConnectHere (formerly deltatree), and typically the recipient does not need to be using the same program as the sender. In fact, if you have a

high-speed, high-quality Internet connection, the recipient may not even realize you're calling from your computer.

With **videoconferencing**, however, it's hard to mistake the fact that you're using a computer to communicate; in videoconferences, the participants are all sitting in front of computers using Web cameras, microphones, speakers, and communication lines to transmit compressed audio and video data. You can use videoconferences to send text-based messages, carry on voice conversations, collaborate on documents, exchange information and drawings on electronic whiteboards, and perform other tasks.

If conducting a videoconference over the Internet, it's wise to use a high-speed connection such as a T1 or T3 line, DSL (Digital Subscriber Line), or cable modem. Videoconferences transmit great amounts of information, so if you don't have a fast connection, you may find the video picture stalling or audio information sporadically being dropped.

Videoconferencing also uses a lot of computer resources, so it's a good idea to be on a system with great processing power.

Microsoft Windows NetMeeting is one of the best-known videoconferencing software programs. Others include CUseMe Pro from CUseMe Networks and ICUII from ICU. ■

has the option of ignoring the request of return notification.

**E-mail-Related Web Sites.** You're probably familiar with Web-based e-mail accounts, including Yahoo! and Hotmail, that let you log on to a Web site to check your e-mail. But there are other Web-related e-mail sites that don't have to do with checking your free e-mail account. Instead, they focus on e-mail-related services such as spam blocking, information delivery via e-mail, and encryption. We cover these topics in depth in the following articles in this section, but here's a quick glance at three key areas.

**Spam.** Unsolicited e-mail, which is commonly known as spam, is the type of e-mail you get in your mailbox when someone sends you information you didn't ask for. This is usually e-mail you don't want and wish you never saw. One service you should be aware of is Brightmail (<http://www.brightmail.com>). Brightmail has a technology called the Probe Network, which Brightmail claims can stop more than 95% of spam. The Microsoft MSN network has recently announced an agreement to incorporate the Brightmail antispam technology into its site, giving users the option to opt-in to the solution, which will divert spam to special storage folders.

**Content delivery.** E-mail is also changing the way we get our news. Content delivery via e-mail is a popular way to stay on top of the days' events. Several services out there help provide your news fix. Most of them work in the same way: You indicate your interest, whether it be the Boston Red Sox, the Federal Reserve, or land use issues in Nepal. Then each day you will receive articles in these topic areas from InfoBeat, Yahoo!, or other content-delivery services.

Backwire (<http://www.backwire.com>) is taking this one step further. Editors and automated bots at this service also search for stories that match user criteria, but Backwire then uses proprietary technology to build and send a customized e-mail newsletter to each user. With, say, 3 million users, Backwire could theoretically be sending out 3 million different e-mail newsletters each day.


**Encryption.** As users send and receive more information through e-mail, security becomes more important. Carnivore, the government e-mail surveillance tool that hit the news last year, got a lot of consumers concerned with who was reading their mail.

in the message, and off the ZixMail goes to your recipient. Yahoo! is also reportedly working on incorporating ZixMail's technology into its site. (For more information on encryption, see the article on page 133.)

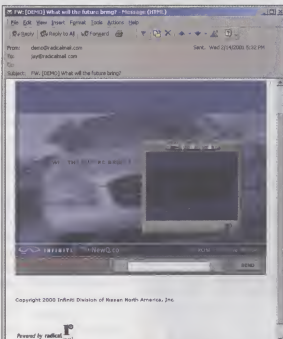
**Hardware Access Options.** As we mentioned earlier in the article, wireless technologies are of great interest to consumers. Not wanting to disappoint their customers, developers and marketers are quick to feed this interest. It's tough to turn on the television without seeing an ad for a wireless product or to be at a large corporation and not see employees checking their PDA (personal digital assistant) throughout the day. And of course, this affects how individuals send and receive e-mail. More and more frequently, people are logging on to their handheld devices to check on e-mail from the boss, spouse, kids, friends, and others.

There's at least one new bit of wireless e-mail technology news to be aware of. ThinAirApps (<http://www.thinairapps.com/business/index.asp>), a New York startup, has teamed with OmniSky (<http://www.omnisky.com>) to provide wireless e-mail service. ThinAir technology will enable OmniSky subscribers to securely access corporate e-mail systems, including Microsoft Exchange, Lotus Domino, and Novell GroupWise. The service is anticipated to work on PDAs and mobile devices such as the Handspring Visor Platinum and Visor Prism, the Palm V and Palm Vx, HP Jornada 540 Series Pocket PC, and Compaq iPAQ Pocket PC.

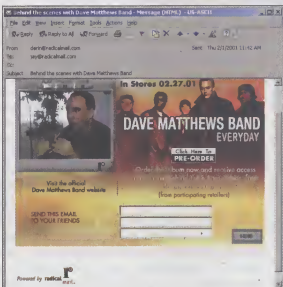
**E-mail's Future Is Bright.** E-mail technologies have come a long way since the first e-mail was sent, and they're sure to continue to evolve. While technologies such as rich-media e-mail, Zaplet appmail, and seamless e-mail tracking may seem unfamiliar

today, it's likely that there will come a day when you look back and ask yourself how you ever lived without them. 

by Heidi V. Anderson



These e-mails from Streaming Media demonstrate the power of rich-media e-mail technology.



Partly as a result of this, encryption became a hot topic. One site working to provide consumers with more information about encryption is ZixIt (<http://www.zixit.com>). ZixIt, makers of ZixMail (an encryption solution), has a page on its Web site that lets you test out its encryption technology. You just type



# A Secure Message

## New Technologies That Affect E-mail Security



E-mail—it's hard to imagine living without it. We use e-mail to communicate with far-away relatives, send work-related material to colleagues, receive updates from our favorite online news services, and more. Some of us would rather give up our telephones than our e-mail access.

And when something is that valuable, it's important to protect it. So we buy virus-scanning software and encrypt sensitive data. But these days, newer technologies have entered the scenes that affect the security of e-mail communications. How do we both protect data being transmitted using these new technologies and take advantage of new technologies that have been developed to do just that?

By knowing what's out there. Here's an overview of some of the newer technologies and some ways in which you can protect yourself.

■ **Wireless.** Yes, wireless technologies have taken the computing world by storm.

And two new technologies deserve special mention: Quartz and Bluetooth.

Bluetooth is a specification (and also a de facto standard) for short-range radio links between devices such as PCs, mobile phones, PDAs (personal digital assistants) and other portable devices. It allows for wireless ad-hoc networking between multiple Bluetooth

devices over short distances. For example, if you have a Bluetooth-enabled PDA, your PDA may be able to synchronize with your PC without hooking it up with cables—as long as the two devices are in the vicinity of each other. Bluetooth devices rely on microchip transceivers that transmit and receive in a frequency band of 2.45GHz, and the maximum range of the link is about 10 meters.

Now, what does all this have to do with e-mail security? Imagine what could have happened if the Bluetooth developers hadn't built in any security features. An unauthorized visitor could walk into your office, place her PDA near your computer and upload information such as your e-mail messages and contact information. Not a good scenario.

Bluetooth addresses these types of concerns in two ways. One, the technology uses a radio frequency hopping scheme, meaning the connection hops around randomly (similar to cordless phone usage). If the aforementioned visitor doesn't know the scheme, she won't be able to

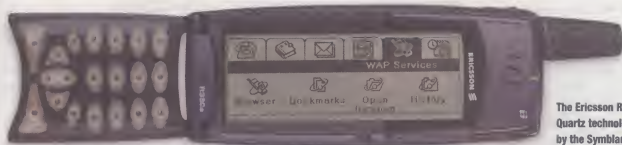
access the data. Two, Bluetooth also includes 128-bit encryption, which means that even if she is able to tap into your connection, the information would be difficult for her to understand.

For an in-depth white paper devoted to Bluetooth technology, and for more information on its current development, head to the Bluetooth site and the whitepaper section (<http://www.Bluetooth.com/developer/whitepaper/whitepaper.asp>) and click the Bluetooth Security Architecture page.

Quartz, from Symbian, is another technology related to wireless applications, but it's what the company calls a "tablet communicator reference design." In plain English: Quartz is software that runs wireless information devices that include features such as e-mail, Web browsing, address books, and more. It includes a standard operating system, POP3 (Post Office Protocol 3) and IMAP (Internet Message Access Protocol) support for e-mail (the two most common standard Internet e-mail protocols), and HTML (Hypertext Markup Language) and WAP (Wireless Application Protocol) support for Web browsing. (For more details on Quartz, head to the Technical Papers page on Symbian's Web site [<http://www.symbian.com/technology/v6-papers/quartz/papers-quartz.html>], where you can read about additional end-user applications, user interface guidelines, and enhancements planned for later versions, including added Bluetooth functionality.)

At least 10 licensees have come out with hardware that relies on Quartz, including Ericsson, Matsushita, Motorola, Nokia and Psion, all of whom make up the Symbian consortium. Trevor Strudley, director of market development in North America with Symbian, says the security features on the numerous Quartz devices vary from device to device, depending on what the licensee wishes to include. For instance, one manufacturer may include a virus checker. Another may incorporate a VPN (Virtual Private Network), a type of network that lets organizations implement secure networks with nodes throughout the world without the need for dedicated physical connections from site to site. Another may include both, and other features as well.

On the consumer side, as these devices become more widespread, it's likely that companies that market to the end user will develop security products such as antivirus software and encryption programs that the end user will install. We're a short way away from seeing this, however.



The Ericsson R380 relies on Quartz technology, developed by the Symbian consortium.

■ **Virus Protection.** Speaking of end-user products, a relatively new type of software for the wireless consumer has recently made its way to the market. There's nothing new about the Palm operating system; we've been using Palm handheld devices since the Palm Pilot line was introduced in 1996. But what is relatively new is the virus threat facing such products. And in March, three major software companies released products to deal with this new threat.

Laura Garcia-Manrique, a product manager with Symantec, which makes the Norton family of products, says her company has been monitoring the wireless space for a while. Last September or so saw the first group of viruses, worms, and Trojan horses affecting this platform. The Liberty Crack Trojan horse is considered the first known Trojan horse for the Palm; it passed itself off as a way to crack the Liberty program for playing Nintendo Game Boy. Soon after, Phage appeared, and this virus infected all programs on Palm devices.

In March, Symantec released Symantec AntiVirus 2001 for Palm OS. Its features include a small footprint, automatic checking for and downloading of new virus definitions when you connect your PC to the Internet, it also has alert windows whenever

a virus is detected with detailed information about the threat and recommendations for appropriate action, and more. It also includes free virus definitions and scanning engine updates for a year.

Other companies also offering antivirus solutions for Palm OS-based PDAs include Network Associates (makers of the McAfee products; <http://www.nai.com>), and F-Secure (<http://www.f-secure.com>), which is based in Finland but has offices around the world.

It isn't just wireless devices that are seeing new developments in terms of virus protection. Traditionally, here's how antivirus software works. The software relies on detection technology that looks at a virus and gets its "signature" and other identifying bits of code. This information, called the definition, is stored in a database of known viruses. The antivirus program then uses specific code to search your e-mail attachment or other file you introduce to your PC for any matches to those definitions. If it finds any, it warns you that you're about to infect your system with a virus. That's why some sites, including Symantec's LiveUpdate, let you go through the Internet to keep your virus definitions up to date.

But Garcia-Manrique says new advancements in virus detection sometimes eliminate the need to look at the particular virus's definition. This newer type of protection uses script-blocking. In other words, the antivirus software looks at the code itself and the behavior the code is designed to create. For example, say you're one of the first people to receive an e-mail message with an attachment called "notyet-namedvirus.exe." The definition for this virus has not yet been created, so the standard virus technology would not necessarily pick it up.

In this case, however, the script-blocking feature goes to work and notices that the file you've been sent contains a Javascript that would send e-mail to everyone in your Outlook address book. A-ha! it thinks; this looks like the behavior of a virus. So it notifies you that you have received potentially malicious code and protects your system from the infection.

**Other Technologies.** Most of the technologies we discuss from here on out may not necessarily be new, but they are important options you might want to consider when it comes to using e-mail.

## Alcatel DSL Modems

DSL (Digital Subscriber Line) technology is nothing new as consumers in certain parts of the country have had it in place for several years now. But industry experts are constantly testing out its security features.

Recently, researchers at the San Diego Supercomputer Center announced they had discovered a security flaw in Alcatel Speed Touch Home ADSL (Asymmetric DSL)

modems, a popular brand of modem sold in the United States. (The warning also applied to the Alcatel 1000 Network Termination Device.) The findings were supported by CERT (the Computer Emergency Response Team), a well-known computer security group.

In theory, no known cases of malicious infiltration had yet taken place—the modem could

allow hackers to go around the user's password and either take control of or disable the device. Potentially, this would let outsiders install other software that could steal credit card information or read unencrypted e-mail. While no such activity has been reported, the researchers say they thought it necessary to warn the public.

For its part, Alcatel (<http://www.alcatel.com/consumer>

[/dsl/security.htm](#)) released a statement that it is looking into the issue and suggested customers install firewalls. In addition, Alcatel includes instructions on its Web site on how to change the modem's settings, but the directions are a bit complicated for the average PC user. The company also says it doesn't plan to update the modem's software at this point. □

**Encryption.** There's more to e-mail security than protecting it from viruses. Security can also mean protecting your e-mail transmissions from prying eyes. For the most part, in the past individual consumers haven't been too concerned about encrypting their e-mail transmissions. But then last summer the news media became filled with reports of Carnivore, a technology developed by the U.S. government that either "snoops" into private e-mail or monitors potentially criminal activity, depending on your point of view.

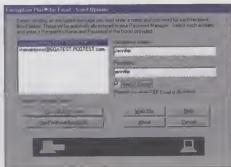
The FBI says they must have court approval to use Carnivore and that it can't take place without the compliance of the individual's ISP (Internet service provider). While a recent study by Pew Internet & American Life Project show that a slight majority of Americans support programs like Carnivore, they also are concerned about the potential for abuse.

That's where encryption software comes in. Although it has been around for a while, especially in the business world, some new consumer applications have been developed. For instance, consider encryption software from PC Guardian (<http://www.pcguardian.com>). Its commercial version of Encryption Plus has been on the market for several years, but the retail price (\$499.95) is prohibitive for many consumers. So the company recently released Encryption Plus Email, a \$19.95 version that plugs into Microsoft Outlook. It offers 192-bit encryption, an encrypted Password Manager, the ability to choose new attachment formats, and other features.

**DSL.** DSL (Digital Subscriber Line) is another technology that is by no means new; however, there have been several developments recently that will and do affect e-mail and other types of security.

One important one is that a new flavor of DSL is on the horizon. Called Symmetric High Density Digital Subscriber Line, or SHDSL for short, it is a standards-based, ITU (International Telecommunications Union)-ratified and sponsored

Personal firewalls, such as the Norton Personal Firewall, protect always-on and other connections from e-mail hackers.



**Encryption Plus Email from PC Guardian protects Microsoft Outlook users.**

technology. It is still in development, but Shaheen Kazi, director of product marketing at Efficient Networks, expects it will be deployed in Europe by this fall and in the United States sometime next spring.

Now, you're probably familiar with ADSL, or Asymmetric DSL. SHDSL will differ from ADSL in some significant ways. One, whereas ADSL is mainly targeted to consumers, who appreciate the fast download times when accessing the Web or retrieving e-mail but don't necessarily need to upload information as much or as quickly, SHDSL is to the business community. The symmetric nature of the connection makes it more feasible for businesses to both receive and send large amounts of information easily. Two, it enables speeds of up to 2.3Mbps (megabits per second) on a single copper pair, and a four-wire model that can provide up to 4.6Mbps is supported by the new standard. And three, its reach is typically farther than ADSL—about 20,000 feet, and that could be extended even farther with the use of repeaters.

But the two technologies are similar in one big respect: security. Because DSL connections are always-on, all flavors, including SHDSL and ADSL, hold a higher risk of being compromised by a third party than a dial-up connection. As Kazi puts it, the SHDSL security features aren't built into the transmission protocols, but rather lie in what she calls the "edge functionality." In other words, the key to building a secure environment is in the end devices (the routers, switches, firewalls, and so on) that will keep your e-mail (and other data) safe from inquisitive eyes.

And with the proliferation of DSL connections these days (for more on DSLs, see the "Alcatel DSL Modems" sidebar), consumers would be wise to check out some of the hardware and software that has been developed to

keep e-mail and other data sent over these always-on connections secure.

One such product is the McAfee Firewall. Common in corporations, firewalls protect the resources of a private network from users from other networks. Personal firewalls, also known as desktop firewalls, protect your Internet-connected computer from other users who try to sneak in via the Internet.

The McAfee Firewall, is a type of personal firewall. It builds a wall around your computer, filtering both inbound and outbound communications. It is designed to defend your PC from unauthorized users attempting to go through a back door into your system. It does so by logging and tracking all connections and connection attempts in a log file, which you can review at any time. (It also works to protect dial-up and cable modem connections). The program runs for \$39.95, and you can download it and find more information at McAfee's Web site (<http://www.mcafee.com>). There's also an online service from McAfee called Personal Firewall available through this site.

**Network Appliance devices.** Lastly, Network Appliance is a company that creates products that help with storage, management, and data delivery on demand. Thousands of companies use Network Appliance gear, and while you may not be involved in that aspect of your business, you might be interested to know that Symantec recently developed its CarrierScan Server to work with NetApp filers and NetCache appliances. CarrierScan Server lets companies integrate antivirus scanning into services such as Web-based e-mail, Web-based file sharing, Internet-available databases and other applications that deliver files over the Internet. [65]

by Heidi V. Anderson

(NOTE: Check out the "Zaplets: A SecureWay To Send Messages" sidebar on our Web site at <http://www.smartcomputing.com/guide/0907/zaplet.htm>.)



**Antivirus products for wireless devices, such as Symantec AntiVirus 2001 for Palm OS, are available.**

# Eudora Pro

## An In-Depth Look At This Powerful E-mail Client



If you have an Internet browser, you already have an e-mail management program. Netscape Navigator users have Netscape Messenger, and Microsoft Internet Explorer users have Outlook. For most people, these programs are sufficient to handle small to medium quantities of e-mail for personal or business use. But if you've found that handling e-mail has become an overwhelming ordeal, you're probably ready for something more powerful. Why not try Qualcomm's Eudora Pro?

**■ Why Eudora Pro?** Many people who deal with lots of e-mail from lots of correspondents for lots of different purposes have found that Eudora Pro is the answer to their problems. Eudora Pro is sort of the Swiss Army knife of e-mail programs; it lets users organize and maintain their e-mail however they wish.

Consider some of the capabilities Eudora Pro provides. Eudora Pro can:

- Filter your incoming e-mail so it is automatically sorted into the right folders. You decide which e-mail goes into which folders, which gets automatically forwarded or redirected to other e-mail addresses, which

e-mail sends notifications to other applications (such as your pager), and which gets tossed into the electronic trash box, unopened.

- Automatically check your e-mail server at intervals of your choice.
- Create e-mail templates for information you send repeatedly.
- Set an alert to let you know if an e-mail is likely to be offensive.
- Manage multiple e-mail accounts from a single program.
- Spell check your e-mail as you type or only when you request.
- Use a variety of automatic e-mail signatures and select the most appropriate one for each e-mail.
- Keep track of your e-mail statistics, including how many messages you sent and received today and yesterday, the total number of messages you sent and received, and the average number of messages you send and receive per day.
- Keep shared files synchronized with other Eudora Pro users. When you make changes to the file, all the others in the

group sharing that file automatically receive the updated copy.

- Search copies of sent or received e-mail for any combination of words or phrases or for messages that don't contain those words. Specify which parts of the e-mail you want to check: subject line, body, To or From field, date, size, or many other options.

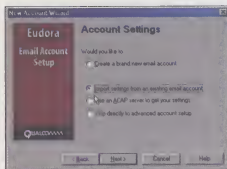
**Pick a version, any version.** The advantages of Eudora Pro go beyond this list of features. For example, one of the program's biggest advantages is that you can get it for free. Eudora Pro is available in two modes: Paid and Sponsored. The Paid Mode costs \$49.95 and gives you all the features and full company support.

The Sponsored Mode also gives you the complete features package and full support, but it costs nothing. You "pay" for the software by allowing advertisers to run a remarkably unobtrusive ad in the lower-left corner of your screen. Also, after awhile, you'll be required to fill out a survey form. This provides Qualcomm and the companies that sponsor the free version with demographic information. This information is used only in the aggregate form, which means that the company and its advertisers may learn collective information about its users, such as that 43% of Eudora Pro users are married college graduates with incomes above \$45,000, but they will have no idea whether you personally fall into that category.

When you install Eudora, you'll also have the option of running a third mode, Eudora Light. Unlike the two Eudora Pro modes, the light version is missing many of Eudora's most useful tools, and it offers much more limited technical support. Odds are that you won't find the light version much of an improvement over the e-mail client you're already using, which is why we don't cover it in this article.

**More good news.** In addition to the above list of Eudora's advantages, Eudora offers another plus: excellent technical support. All users get access to Eudora's Technical support Web site, online tutorials, and online knowledge base, where you can look up articles about Eudora's common problems and concerns. The software's built-in help files are good, and the Web site offers an exceptional manual you can download free. Those who use the paid or sponsored modes also get free technical assistance from the live technical support staff up to six times per year.





**When first setting up Eudora, clicking the Import Settings From Existing E-mail Account radio button will automatically transfer all the proper settings from one of your existing e-mail accounts and enable Eudora to start accessing the same e-mail accounts immediately.**

Eudora doesn't mention this advantage, but we think it's worth considering. Most of the viruses created to attack and spread through e-mail systems target Microsoft Outlook because it is by far the most common e-mail client out there. Part of the reason for its popularity is that it comes with the Windows operating system installed on most computers. Programs written to attack Outlook and take advantage of its components are unlikely to have any effect on your Eudora files.

**A few minuses.** There are trade-offs to using Eudora, of course. If you use IE, you'll find that Eudora isn't as tightly integrated with Microsoft products as Outlook is. Where IE and Outlook function almost seamlessly as a single program, you'll probably be more aware that different programs are at work when using IE with Eudora.

As good as the Eudora technical support is, the online help area is not as strong as that of some other software companies. Most problems and concerns seem to be addressed there, but you may find yourself using the phone or e-mail technical support once or twice for the answer to a question you'd expect to find on the Web site.

Also, Eudora's mood indicator, which alerts you to the possible offensiveness of incoming mail, may be oversensitive for some users' tastes. It may send you warnings about e-mail that you find totally innocuous. This is something you'll have to play with to determine for yourself whether it's useful.

Do also keep in mind that if your e-mail comes through an online service such as America Online or CompuServe, or through a Web-based e-mail system such as Hotmail or Yahoo! Mail, Eudora won't do you any good.

These services use their own proprietary e-mail systems, and the only way to access your e-mail there is through their software or their Web sites.

**■ Program Setup.** If after considering both the pros and cons of Eudora Pro, you're ready to make it your e-mail client, here's how to get started. The first time you run Eudora, it will call up the New Account Wizard, which will ask you if you want to create a brand new e-mail account, import settings from an existing e-mail account, use an ACAP server to get your settings, or skip directly to advanced account setup. Assuming you have an e-mail account with another ISP (Internet service provider), your best bet is to select the Import Settings From An Existing Account radio button.

The Eudora software will search your system for e-mail settings for whatever ISP or ISPs you're using and then present them to you in the Import Settings window. Select the accounts you want to access through Eudora and click Next. If you're setting up Eudora on a computer that doesn't already have information about your e-mail accounts, you'll need to find out the address of your ISP's e-mail servers. There are two: one for sending e-mail and one for receiving e-mail. They may or may not both be the same.

You'll also need to know if your e-mail system uses a POP (Post Office Protocol) or IMAP (Internet Message Access Protocol)

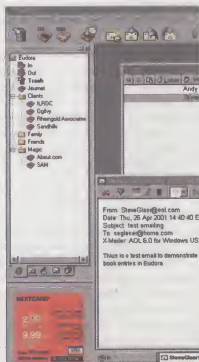
system. If you're using an ISP for your e-mail, odds are you have a POP system. The easiest way to find this information is to look it up on the computer you've previously used for e-mail. Netscape users can find the information in the Netscape e-mail window by choosing Preferences from the Edit menu and then choosing Mail & News groups, Mail Servers. You'll find your incoming and outgoing e-mail servers listed there. Click Edit and look at the server type to discover whether you're using a POP or IMAP server. IE users can open Outlook Express and choose Accounts from the Tools menu. Then click the Mail tab, double-click the connection, and click the Server tab. Alternately, you can just call your ISP.

**Pick a personality.** Eudora refers to your e-mail addresses and settings as personalities. If you choose to use the e-mail settings of an existing account with Eudora, the e-mail address and settings from that account will be your main account in Eudora; it's called your dominant personality. You may want to set up several personalities; for example, you might want one personal personality, where you exchange e-mail with friends and relatives, and a work personality, where you exchange business e-mail.

To set up a new personality, choose Personalities from the Tools menu. Right-click in the box on the left side of the screen that shows your existing personalities and choose New from the pop-up menu. Follow the steps in the New Account Wizard.

**■ Put It To Use.** When you first open Eudora, you'll see that you begin with three electronic mailboxes: an In box where Eudora keeps all your incoming mail, an Out box where Eudora files all the mail you send, and a Trash box for e-mail on its way to deletion. To get the most out of Eudora, you may want to create additional mailboxes for different purposes.

If you're on one or more e-mail discussion lists, for example, you might want to create a mailbox for each list. That way you can direct all the e-mail from your International Matchbook Collectors group into one mailbox and route your Recipe Exchange e-mail to another mailbox, and neither will get mixed up with the professional interest



**In the free Sponsored Mode, Eudora presents relatively unobtrusive advertising in the lower-left corner of the Eudora window.**

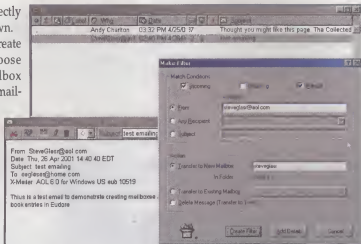
e-mail that goes directly to a mailbox of its own.

**Mailboxes.** To create a mailbox, just choose New from the Mailbox menu and give the mailbox whatever name you want. By checking the Make It A Folder checkbox, you create a folder that will hold several mailboxes. In this way, you can create a Family folder that contains individual mailboxes for your sister, your mother, and your Uncle Fred. You can create a mailbox within an existing folder by right-clicking the folder and choosing New from the pop-up menu.

Unless otherwise directed, all incoming mail comes into the In box, and all outgoing mail is filed in the Out box. You can have Eudora automatically direct e-mail into additional In and Out boxes you create by using filters. Eudora's filtering capabilities are immensely powerful; a full discussion of them could fill an article all by itself. Because we don't have that much room, we'll just help get you started.

**Filters.** The simplest way to filter e-mail is to wait until you have a piece of e-mail that you'd like to assign to a specific mailbox, whether you've already created that mailbox or not. Click the e-mail to highlight it and then choose Make Filter from the Special menu. A Make Filter dialog box will pop up, with information from that e-mail automatically in place. The top half is the Match Conditions area, where you choose what conditions will activate the automatic filtering. Select whether this filter is for incoming or outgoing mail, then choose whether you want the filter to look at the From line, the list of recipients, or the Subject field. You'll see those fields filled with the information from the e-mail you selected. You can leave it as is or edit it. Either way, if the text you specify is in the field you specify, the filter will go to work.

The Action portion of the Make Filter dialog box is what specifies what the filter will do. The default is to send the e-mail to a new mailbox, and it will recommend a name for the new mailbox. Keep the suggested name



**Automatically create a mailbox filter from any e-mail by highlighting it and choosing Make A Filter from the Special menu.**

or change it as you like. If you want the mail to go into a mailbox you've already created, select Transfer To Existing Mailbox and then select the mailbox you want to use. If this is e-mail you want to delete and never see, select Delete Message, and all e-mail that matches the conditions you've specified will be sent directly to the Trash box.

### ■ Stationery & Signature Templates.

Eudora is by no means difficult to use, but if there's anything confusing about it, it's stationery. The feature is simple enough, but Eudora uses the term differently than other e-mail software does. Most other e-mail clients use the term "stationery" to refer to graphics background that make e-mail look like it's on, well, stationery. In Eudora, however, stationery refers to e-mail templates that free you from having to write the same basic letter over and over again.

To make a template, bring up the Stationery menu on the left side of the screen by clicking the envelope icon. The menu will be blank before you create your first template. Right-click anywhere on the menu's blank area and select New from the pop-up menu.

You'll get an e-mail composition form with the Send button disabled. Fill in the To, Subject, Cc, and Bcc, areas if appropriate and then type in your template letter.

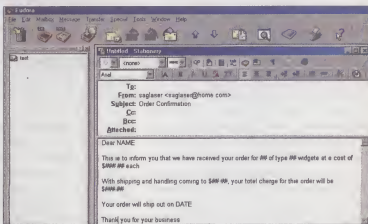
When you're done, choose Save As Stationery from the File menu and save the file in the Save As Stationery dialog box. You can modify the stationery later by right-clicking it in the Stationery menu, choosing Edit from the pop-up menu, and making whatever changes you like. When you're done, use the Save As Stationery command to save it once more.

You can now call up the stationery just by double-clicking its name in the Stationery menu. To reply to an e-mail using that stationery, choose Reply With from the Message menu and then select the stationery file you want to use.

**Signatures.** A signature is a short text file that appears at the bottom of your e-mail. It can be just your name or something longer, including your Web address, a plug for your business, or a favorite quote. You can create a signature template in much the same way as a stationery template.

Click the Signature tab, which features a pen icon on the left side of the Eudora screen, and right-click the blank area of the Signatures menu. Click New from the pop-up menu and type a name for your new signature in the Create New Signature dialog box. Click OK. In the window that pops up, type the text you want to use for your signature. You can format the text using the text tools at the top of the window. When you're done, click File, Save As.

You can select a signature as your default by choosing Options from the Tools menu and then clicking Composing Mail. Select the signature you want as the default from the



**Eudora's Stationery feature lets you create e-mail templates you can call upon to speed up the creation of e-mails you send frequently.**

Signature drop-down list in the When Not Using Stationery area.

■ **Productivity Tips.** Here are some things new users and seasoned users alike will benefit from learning. These tips will help you use Eudora more efficiently.

**Make address additions quickly.** Eudora features an Address Book where you can store names, e-mail addresses, and other contact information about your friends and associates. Open it by clicking the book icon on the toolbar. To rapidly add somebody to your address book, open an e-mail from them and press CTRL-K.

**Remember that less is more.** Keep your main In box, Out box, and Trash box as empty as possible. These files can slow down your system when overly full. Don't forget to empty your Trash box often and store your incoming and outgoing mail in other mailboxes.

**Plan your mailbox structure.** There is no right way to organize your mailboxes, just come up with a system that works best for you. But take time in advance to plan a structure that makes sense and that will make it as easy as possible for you to find what you want.

**Use filters to reduce junk mail.** If you notice the same address is repeatedly spamming you (sending you junk e-mail), use filters to send e-mail from that address directly to your Trash box. However, be careful about filtering out all e-mail from addresses with domain names such as Hotmail.com. While many spammers use these free e-mail services, so do other legitimate sources.

**Transfer instead of copy.** When manually moving e-mail from one mailbox to another, use the Transfer command (right-click the e-mail you're moving and choose Transfer from the pop-up menu) instead of copying and pasting. If you copy the e-mail, you'll have two copies on your system: one in the first mailbox and a duplicate in the second. Transfer moves the one copy from one mailbox to the other, which saves you space.

**Download the manual.** While Eudora's built-in help files are good, the well-illustrated online manual can be even more helpful while learning your way around the program. And you can keep it open as you work. The link to the manual is on the Eudora manual download page at <http://www.eudora.com/techsupport/manuals.html>. You'll need Adobe Acrobat Reader to read it; if you

Within Eudora itself, the most common problem is a glitch in the settings, particularly the server addresses and server configuration setting (POP or IMAP). Even if you set them up properly, there are events that can cause them to change accidentally, so check these first. Click Tools then Options and check the settings in the Getting Started, Incoming Mail, and Sending Mail areas.

An incorrect date on your computer, especially a wrong year, could also cause problems in Eudora. Check it by double-clicking the time display in the extreme lower-right corner of your monitor.

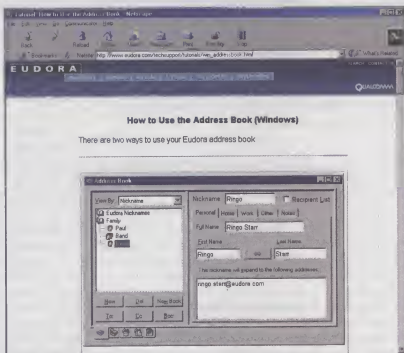
If Eudora repeatedly asks you to rebuild a mailbox's table of contents, you'll need to exit Eudora and find that mailbox's .TOC file in the Eudora directory. If the problem is with a mailbox called FredMail, for example, you'll probably find the .TOC file in C:\PROGRAM FILES\QUALCOMM\EUDORA. If the mailbox is within the Friends folder, look for the Friends folder in the same place you looked for the FredMail.toc file. When you find FredMail.toc, change the name to

FredMail.000, then reopen Eudora and see if the problem goes away. If not, contact technical support.

If you're having trouble sending attachments to another person, make sure you're using the right format. While MIME (the default) is the most popular format now, older Macs use BinHex, as did old versions of Eudora. Some old PC systems may still rely on the UUencode format. You can change the format you use for attachments with the far right drop-down list at the top of your mail composition form.

■ **A Worthy Alternative.** Even though Eudora Pro isn't as popular as Microsoft's Outlook, it offers many great features. And if you're looking for an e-mail client that gives you a lot of power to manage your messages, Eudora may be just what you're looking for. ☐

by Steve A. Glaser and Elizabeth Lewis



Get detailed additional help from the online Eudora tutorials. They use text, illustrations, and animation to help you advance your e-mail-handling skills.

don't have it, you can download it for free at <http://www.adobe.com/products/acrobat/readstep.html>.

**Run the tutorials.** These multimedia files use text, pictures, and animations to guide you step-by-step through Eudora's most powerful and useful features. You can find them at <http://www.eudora.com/techsupport/tutorials>.

■ **Troubleshooting.** The most common reason to have trouble sending or receiving e-mail with Eudora, or any other e-mail program, is that the ISP or the ISP's mail server is down. This isn't a Eudora problem, of course, and all you can do is wait it out. Usually, such outages don't last long. The quickest way to check if this is the cause of your problem is to open your Web browser and try to connect to a Web site. If you can't seem to get anywhere on the Internet, it's a safe bet that the problem is with your ISP. Call the ISP to let them know you're having problems and see if they can help you.

# Outlook Express

## The Little E-mail Client That Could



**O**utlook Express has finally come into its own as a full-fledged e-mail program.

Outlook Express, Microsoft's e-mail and news reader program for home and small-business users, finally hit its stride with the 5.x releases. Long thought to be little more than a minor evolutionary change to the Internet mail client bundled with Windows 95, Outlook Express is now a full-featured mail client, able to stand on its own.

**■ What's In It For You.** Don't just take our word for it, though. If you're still not sure Outlook Express offers enough features to satisfy your e-mail needs, read on. (Outlook Express versions 5 and 5.5 have the same features; the latest version, 5.5, just offers several fixes. This article was written with 5.5 in mind, but aside from several differences in the way some of the wording in dialog boxes and menu items appear, you shouldn't notice any difference.) Here are some of the things Outlook Express offers:

- Microsoft overhauled the Outlook Express start page, adding quick access to the functions users need most often, including reading new mail and creating new messages.

The start page also offers easy access to the Outlook Express address book.

- In addition to the cosmetic overhaul, Outlook Express also includes a new identities system, making it attractive to households sharing a single computer. The identities function lets each user create a password-protected account for e-mail, contacts, and program settings.
- Improved message rules and an enhanced rules editor make it easier to automate tasks such as moving, deleting, or flagging incoming messages. Rules can be based on the mail header, the body of a message, or even the size of a message.
- The most frequent use of message rules is to block junk mail. Outlook Express includes a built-in message rule for blocking and deleting specific messages or e-mail addresses.
- Outlook Express offers improved offline support and improved connection features. You can configure the new connection management system to hang up when mail has finished sending or receiving, automatically dial when checking for messages if no connection exists, or create a connection automatically when Outlook Express first starts.

Most of the connection management features are geared toward dial-up accounts, but Outlook Express works equally well with DSL (Digital Subscriber Line), cable, or LAN (local-area network) connections.

- If you have a Hotmail account configured for use with Outlook Express, you can mirror your Web-based Hotmail folders. The Synchronization option ensures that Web-based Hotmail data and Outlook Express Hotmail data remain in synch. For example, move a message from one folder to another in Outlook Express, and the Synchronization tool will move the same message on the Hotmail Web server.
- With the addition of identities, each user has a personal address book as well as a shared contacts folder. Every user can view the shared folder, while the identity holder is the only person who can view the personal address book. You can also use drag-and-drop contact information to move it between personal and shared address books.
- Outlook Express lets you create multiple signatures, in text or HTML (Hypertext Markup Language) format. You can store signatures within Outlook Express or as a separate text file. Each e-mail account can have its own default signature, and you can easily change the signature when composing an individual message.
- Outlook Express lets you use background images to jazz up your messages. Dozens of stationery choices are included; you can also download additional stationery or create your own using the built-in Stationery Wizard.
- Outlook Express 5.5 includes bug fixes as well as built-in 128-bit data encryption for a more secure messaging system.

**■ More Good News.** The above features aren't the only things Outlook Express has to gloat about; the program has other benefits, too. For example, Outlook Express has improved ease of use, not just with setup wizards (which are helpful, but users tend to use them only occasionally), but also with day-to-day functions. The most frequently used functions are available from the start page and are also available at all times from various menus and toolbars.

Another benefit of the program is that its customizable toolbars let you rearrange tools, or add the functions you use most often, for quick and easy access. You can also,



get rid of the functions you don't use, freeing up space in the toolbar.

Outlook Express boasts a wide selection of formats for importing address books, messages, and mail account settings, which makes it easy to migrate from other e-mail programs. And speaking of other e-mail programs, most other free programs can't match the feature set found in Outlook Express 5.x. Unlike some free e-mail programs, Outlook Express is advertising-free.

■ **The Bad News.** Every program has to have a downside. One of the cons of Outlook Express is that although you can password-protect identities, the protection is limited, and it's easy for others to bypass it.

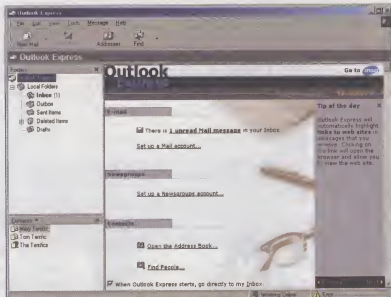
Another problem is that the Windows versions of Outlook Express are not available as standalone products. If you want Outlook Express, you also have to download and install Internet Explorer.

As part of the popular Microsoft family, Outlook Express and Outlook are the major transporters of malicious e-mails. You can avoid some of the dangers of e-mail viruses by not opening attachments and not viewing HTML messages in the preview pane.

Unfortunately, Outlook Express offers poor export features, limited mostly to Microsoft Outlook or Microsoft Exchange formats. Additionally, there's no simple method to back up messages, address books, or account information from within the program.

■ **Set Up & Use Outlook Express.** You've contemplated the pros and cons of Outlook Express and decided you'd like to give it a try. We'll help you get started.

**Your account.** To set up an e-mail account with Outlook Express, start the Internet Connection Wizard. If this is the first time you've launched Outlook Express, the program will automatically take you to the Internet Connection Wizard. Otherwise, go to Tools, Accounts, and click the Mail tab. Click the Add button and select Mail from the pop-up menu.



The new Outlook Express start page provides easy access to the most often used functions, including mail and the address book.

Enter your name in the Display Name section of the Internet Connection Wizard. This is the information Outlook Express will display in the From field when you send e-mail. Click the Next button to proceed and then choose the I Already Have An E-mail Address That I'd Like To Use radio button. Enter the e-mail address from that account and click Next. (If you don't have another account, click the I'd Like To Sign Up For A New Account From radio button, and Outlook will help you set up a Hotmail account you can access through Outlook Express.)

From the drop-down menus on the next page, select the type of mail server protocol your e-mail host uses. Then enter the name of your incoming mail server (for example, mail.microsoft.com) and the name of your outgoing mail server (for example, smtp.microsoft.com) in the appropriate text boxes. Click Next.

Enter your e-mail account username and your password in the text boxes on the following page. Then click the Remember Password checkbox if you want Outlook Express to automatically remember and

use your password whenever you access your e-mail account in the future.

If you want to check any of the information you've entered, click the Back button. Otherwise, click Finish to finish setting up your e-mail account and then click Close.

**Signatures.** If you want to make your new account feel more homey, a signature line may be just the thing. Signatures are lines of text that automatically appear at the end of e-mails. They usually include your name, your personal or business Web site address, your favorite saying, or whatever you want to use as a closing to your messages.

To create your own signature, go to Tools, Options, and click the Signatures tab. Click New and place a check mark next to the Add Signatures To All Outgoing Messages checkbox. In the Text field of the Edit Signature section, type the text you want to include in your signature. When you are satisfied with your new signature, click Apply and then click OK to close the dialog box.

**Stationery.** Outlook Express includes an assortment of stationery (background pictures, colors, and font selections) you can use to punch up your messages. To choose a piece of stationery, click the down arrow next to the New Mail icon in the Outlook toolbar. Make a selection from the

drop-down list, and a new message window will display the selected stationery.

The stationery list only shows 10 items: either the first 10 pieces of available stationery or the last 10 pieces of stationery you used. To access additional stationery, click the same down arrow, but this time choose Select Stationery from the drop-down list. The Select Stationery dialog box will display a list of



You can set up one or more signature files for each account or identity, with your name, Web site address, favorite quotation, or any text you want to include at the end of every message.

available stationery. Put a check mark in the Show Preview checkbox and then highlight the name of one of the stationery choices to preview it in the Preview pane. When you find one you like, click OK. A new message window will open, displaying the selected stationery.

**Identities.** Outlook Express supports multiple users, called identities, with separate mailboxes, separate user settings, and the ability to switch between identities without restarting Outlook Express. To create a new identity, click File, Identities, Add New Identity. Enter a name in the Type Your Name text box and put a check mark in the Require A Password checkbox.

In the Enter Password dialog box, enter a password, type it again to confirm it, and then click OK. Click OK again to close the New Identity dialog box. To switch between identities, choose Switch Identity from the File menu. In the Switch Identities dialog box, click to select an identity. Enter your password if necessary and then click OK. To select a default identity, choose Identities from the File menu and choose Manage Identities. Place a check mark next to Use This Identity When Starting A Program. From the drop-down list of available identities, select the one you want to use as the default and then click Close.

■ **Productivity Tips.** Even experienced users are happy to learn a few tips to make them more productive. If you're new to

Outlook Express, use these tips to get started on the right foot.

**Back up e-mail messages.** There are few things worse than starting your computer and discovering you've lost important files because of a hardware or software problem. To back up your e-mail messages, click the New Mail icon in the Outlook Express toolbar.

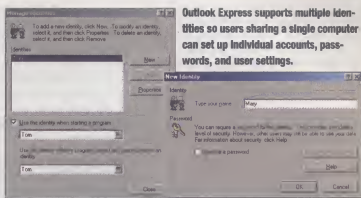
Move the New Message window out of the way so you can see your Outlook Express folders. Highlight the folder you want to back up by clicking it once. Select all the messages that appear in the Message List pane and drag them to the body text area of the New Message window you opened earlier. The messages will be added to the New Message as attachments.

In the New Message window, go to File, Save As and select a location for the backed up messages. Enter a name for the saved file. Make sure the Save As Type field is set to Mail (\*.eml) and then click Save. Outlook Express will save the messages from the selected folder as individual attachments to the new message.

**Restore messages from a backup.** If you have a hardware or software failure, you can restore your e-mail messages from the backup by locating the backup and double-clicking the file to launch Outlook Express. The Attachment pane of the message that opens will display a list of the saved messages. Click anywhere within the Attachment pane and then go to Edit, Select All. Drag the highlighted messages to the desired folder in Outlook Express. You can then access the messages as usual.

**Send mail to a group.** To send an e-mail to a group of people without entering their individual e-mail addresses, you'll have to create a distribution list. Choose Address Book from the Tools menu. In the Address Book window, go to File, New Group.

**Outlook Express supports multiple identities so users sharing a single computer can set up individual accounts, passwords, and user settings.**



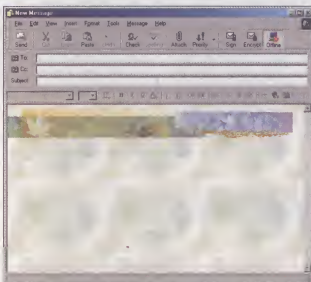
Click the Group tab in the Properties dialog box and enter a name for the group in the Group Name field. Click Select Members.

The Select Group Members window will display the current entries in your address book in the left-hand pane, and the current members of this group in the right-hand pane. To add a member to the group, click her e-mail address and then click Select. (Press CTRL and click to choose noncontiguous names from the address book or press SHIFT and click to select a range of names.) When you have added all members to the group, click OK twice.

**Change the way Outlook Express starts.** When it launches, Outlook Express displays the Outlook Express start page. If you'd like to save a little time and go directly to your Inbox, set your Inbox as the default startup point by choosing Options from the Tools menu and clicking the General tab. Put a check mark in the When Starting, Go Directly To My 'Inbox' Folder checkbox and click Apply. Click OK to close the Options dialog box.

**Block messages.** You can prevent Outlook Express from displaying messages from specific recipients and even have the program automatically send unwanted messages to your Deleted Items folder. First select a message from a sender that you want to block. Then go to Message, Block Sender. Outlook Express displays a dialog box telling you that it will block any future messages from that sender. It also asks if you would like to automatically remove any existing messages from that sender in your mail folders. Click Yes if you want to delete the messages and No if you want to keep them.

To unblock a message sender, start by closing any open messages. Then go to Tools, Message Rules, Blocked Senders List and click the Blocked Sender tab. Click to highlight the sender you want to remove from the list and click Remove. When Outlook Express asks if



**You can jazz up messages with Outlook Express's built-in collection of stationery. Don't like your choices? You can download additional stationery or create your own look.**

you're sure you want to remove the sender, click Yes. Click OK to close the dialog box.

■ **Troubleshooting.** Even experienced Outlook Express users may run into problems sometimes. See if the following advice can help.

**Unknown errors.** Outlook Express has its share of Unknown errors. Essentially, this error message means that Microsoft has no idea what the problem is, and you are on your own.

One of the common error messages you may see is: An unknown error has occurred while attempting to receive mail. Please check your account settings, net connection, and TCP/IP configuration. Or: An attempt to allocate memory failed.

While these messages could mean there is a configuration problem, they are just as likely to pop up because you are running low on memory or disk space. This happens most often when you have many programs open or when you're attempting to download e-mail with large attachments. Although the message is a bit of a mystery, there are ways to deal with it.

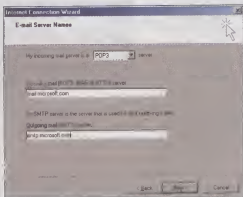
To free up memory, exit all open programs, restart Outlook Express, and try downloading e-mail again. If you still have problems, your hard drive may be almost full. To free up hard drive space, click Start, Programs, Accessories, System Tools, Disk Cleanup. Then select the drive where Outlook Express is installed, usually your C: drive. Follow the on-screen instructions in the Disk Cleanup utility. When the Disk Cleanup utility is finished, restart your computer to clear out your system's RAM and then try downloading e-mail again.

**Messages stuck in your Outbox.** When you try to send an e-mail message, you may notice that Outlook Express moves it to your Outbox but doesn't send it. There are four ways to remedy this. One is to simply force Outlook Express to send a message. Click the Outbox folder to select it and select the problem message from the list of messages. Open the message and then click Send.

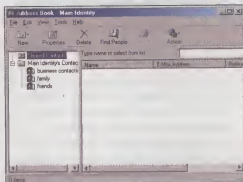
If you are in offline mode, Outlook Express will queue outgoing mail in the Outbox until the next time you connect to the Internet. Solve this by simply going to File, Work Offline and

making sure there isn't a check mark next to it. If there is a check mark, select Work Offline to toggle back to online mode. Once you're back online, go to Tools, Send and Receive, Send All.

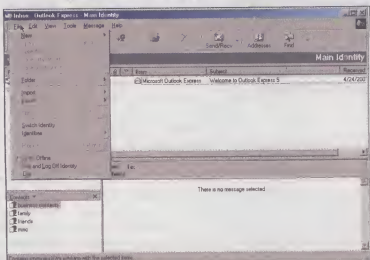
A third solution is to change the Send option to Send Messages Immediately. Go to



**The Internet Connection Wizard will walk you through the process of setting up your e-mail account. You may need some information from your current e-mail program or your e-mail provider.**



**Save yourself the hassle of typing individual e-mail addresses when sending the same message to a group of people by setting up distribution lists.**



**If Outlook Express isn't sending outgoing messages, make sure you haven't set Outlook Express to work in offline mode.**

Tools, Options and click the Send tab. Put a check mark in the Send Messages Immediately checkbox. Click Apply and then OK. Go to Tools, Send and Receive, Send All, to send all queued messages.

Of course, if your Outbox is damaged, Outlook Express won't send your messages. The easiest way to correct the problem is to delete the Outbox and create a new one. (Do not use this method if you have more than one identity.) Exit Outlook Express first, then click Start, Find, Files Or Folders. Type outbox.dbx in the Named text box, make sure the Look In field displays the drive where Outlook is located (usually C:), and click Find Now. Only one Outbox should appear in the search results list. Delete it by right-clicking it and selecting Delete from the pop-up menu. Restart Outlook Express; it will create a new Outbox.

If you have more than one identity or you find multiple outboxes when you search, you'll need to import your Outbox into a new identity. Start by creating a new identity. (See the Identities section above.) Then go to File, Import, Messages. Select Outlook Express from the list of e-mail programs and click Next. In the Import from OE5 dialog box, click the Import Mail From An OE5 Identity radio button. Select your old identity from the list. (If your old identity was password-protected, you will be asked to supply the password.) Click OK. The Outlook Express import utility will display the path name to your old identity. Click Next and then click the All Folders radio button. Finally, click Next and then Finish.

Now that we have imported all messages from your old identity into your new one, use your new identity for all future messages.

■ **A New Outlook.** If you always thought Outlook Express couldn't match up to the strengths of its big brother Outlook, maybe it's time you gave it another look. The latest version likely offers just what you need. **GS**

by Tom Nelson and Mary O'Connor

# Have Connection, Will E-mail

## Send & Receive Your Messages Using Web-Based Programs



Here's a rundown on five of our favorite ISPs.

■ **Eudora Web-Mail.** Although everyone knows about Eudora Pro software, few realize Eudora also offers free Web-based e-mail. You won't get voice mail or instant messaging with Eudora Web-Mail, but you will get a hefty 4MB of storage space. And no need to worry about exceeding your limit—when you max out, you'll receive an e-mail notification giving you 10 days to trash some of your stored mail. If you're an infrequent user, log in at least once every six months to keep your account from being deleted.

If you want to retrieve e-mail messages from another POP (Post Office Protocol) account, all you need to know is the name of the other e-mail server, your username, and your password. You can also set options to get all of the mail from your other server or only a specified number. Additionally, you can choose to read the messages but leave them stored on your other server.

Eudora Web-Mail provides an auto-reply message for when you know you won't be able to check your account for several days. If you are going on vacation for a few days, set up the auto-reply feature to take care of your incoming e-mail messages. To set up the auto-reply, go to the Settings drop-down menu near the top of the page, click Options, Auto-Reply, and click the Go button. Next, create your message and select the days you'll be unavailable. When someone sends you an e-mail message during that time, the system will automatically send him or her the message.

To keep spam out of your Inbox, set up a Spam Block to block all e-mail except from people listed in your address book or selectively block individual spammers. Eudora Web-Mail also tracks known spam offenders and lets you tap into its list to block e-mail from those addresses as well.

<http://www.eudoramail.com>

■ **Excite.** When you sign up for Excite's e-mail service, you get far more than basic e-mail delivery. You'll have access to free voice mail, free fax delivery, and free real-time chat. Excite even throws in 100 professionally printed business cards for new customers.

Excite Inbox lets you store up to 3MB or 1,000 messages in your account. Voice mail and e-mail messages, faxes, and your unemptied trash all count toward your limit. To check how close your storage is to being full, click Storage Limits beneath the Controls heading on the left of the page for up-to-date statistics.

The voice mail feature is easy to set up and a breeze to use. Activate your voice mail by clicking the link at the top of the page or by clicking the Preferences link under the Controls heading to the left of the page. Excite provides a toll-free phone number along with a personal 10-digit extension. Callers can leave messages that are up to 90 seconds long or they can send you a fax. Within seconds, the voice mail or fax is received in your Inbox. To hear your voice mail messages, your computer will need to be equipped with a sound card, speakers, and RealAudio player.

Want to access your e-mail from a friend's house or while you're on the road? Your Excite Inbox can fetch e-mail messages from up to five other POP servers, as well as forward mail to any of your other e-mail accounts. If you have hundreds of names in your ISP e-mail account, you can easily transfer them to Excite from Microsoft Outlook, Netscape Mail-Client, Eudora, and even your Palm handheld computer.

If you're unhappy with the blah colors of your Excite Inbox, you'll love picking one of Excite's color themes. Click Preferences and then Color Selector to choose the neon green color of Techno or the hot purple of Hawaiian Punch.

Other Excite perks include free instant messaging and the software to create video e-mail messages.

<http://www.excite.com>

■ **Hotmail.** By its own admission, MSN's Hotmail is the world's largest provider of free

**Y**ou've probably seen ads for free e-mail but wondered why you need it. After all, you have a perfectly good ISP (Internet service provider) that supplies you with a full-featured e-mail account. That's great, but how do you get e-mail when you're traveling or read personal mail when you're at work? Simple. Get a Web-based e-mail account.

Using free e-mail services such as Hotmail, Yahoo!, and Excite, you can send and receive e-mail from any Internet-connected computer in the world. And with some accounts, you don't even need a computer—you can your check e-mail via a toll-free phone number.



Web-based e-mail. With a Hotmail account, you'll get 2MB of storage space, and if you don't keep your account below the limit, you'll risk losing messages. If you can't get by on 2MBs, send a blank e-mail to [hmoex@hotmail.com](mailto:hmoex@hotmail.com) for information on storing messages on your local computer.

Hotmail also gives you a lot of control over which e-mail messages you accept. Using the Inbox Protector, users can control the amount of junk mail they receive. The Inbox Protector filters bulk mail into a folder, which is emptied every two weeks. You can further customize the settings to only accept messages from people in your Address Book. And if someone's being a pest, you can manually block all e-mail messages from that particular sender. To turn the Inbox Protector on or off, click the link at the top of the page or click Options, also at the top of the page.

Clicking the Options tab gives you access to many features you might like to change, update, or customize.

If you belong to a mailing list and want to keep those messages separate from your personal mail, use the Filter feature to direct specified e-mails to a folder of your choosing. For example, if you belong to a handheld computing mailing list and every message from the list contains the word "Palm" in the subject line, you can automatically direct all of those messages into a folder labeled Palm.

Clicking the Preferences link lets you control the appearance of your page, including how many messages to display per page and the default line width. You can also select whether or not to automatically include quoted text when replying to a message.

If you do a lot of traveling, you'll appreciate the option of accessing the POP account you have with your existing ISP or business. To set up access, you'll need to know your POP server name, username, and password. The POP option lets you check your e-mail account provided by your ISP without actually transferring the messages to Hotmail.

Worried about viruses? No need. Hotmail automatically scans incoming and outgoing attachments using McAfee's Virus Scan.

<http://www.hotmail.com>

■ **Net@address.** Your Net@address account is a snap to set up, easy to navigate, and simple to use. Net@address is a service that lets you store up to 5MB of e-mail and receive automatic notification of your storage status whenever you log in to your account.

## Hot For Hotmail

**W**e checked with some of the other popular Web-based e-mail providers and found that with 89 million unique users, MSN's Hotmail is among the largest free Web-based e-mail providers in existence today. To get your free 2MB of online mail storage and to access your e-mail from any Internet-connected computer in the world, you'll want to follow these simple steps and set up your own account.

Go to Hotmail's home page (<http://www.hotmail.com>) and click Sign Up Now! at the top of the page to register. Next, fill in the blanks to set up your user Profile, including name, address, time zone, and ZIP code. Scroll down the page to Account information where you'll select a username and password. You'll also select a secret question and answer just in case you forget your password. Then click the Sign Up button.

At this point in the registration process, Hotmail notifies you if another user already has your preferred username. Because of the large number of Hotmail subscribers, you may try

several names before you find one that's not already taken. Don't be surprised if you end up with a name like [ksmith72931](mailto:ksmith72931).

Next, Hotmail's Terms Of Use page appears. These are the general rules that all e-mail services have. They include provisions that prohibit you from sending chain letters, junk mail, and spam or from using your account to engage in illegal activities. At the bottom of the page, click a button to accept or decline the terms.

After accepting the Terms Of Use, you'll be able to sign up for free subscriptions to publications and e-mail newsletters on topics ranging from business to women. Once you've completed your selections (if any), click the Continue button and you'll be at your Hotmail Inbox.

At the top left of the Hotmail screen are five buttons: Inbox, Compose, Address Book, Folders, and Options. You'll always know where you are because the button for the active page is displayed in a different color than the other four buttons.

**Inbox.** This is where you'll see a summary of all of your

incoming mail. The screen shows you the subject, sender, date and size of the message. To read a message, click the link in the From column. Once you've read the message, you can choose to forward, delete, or reply to the message.

**Compose.** To write a new message, click Compose, fill in the To: and Subject: blanks, then type away. If you're unsure about spelling, you can click the Check Spelling, Dictionary, or Thesaurus buttons. If you want to save a copy of your outgoing message, place a check mark in the box next to Save Outgoing Message.

Would you like to add a photo or document to your e-mail? Click the Attachments button and follow the steps on the next screen. Click the Browse button to locate the file you want to attach and then click the Attach To Message button. Your attachment will be automatically scanned for viruses.

Want your e-mail to look cool? When composing a message, click the Add Stationery button to select a colorful background. Choices include such themes as a

Click the plus (+) key next to the Preferences link to the left of the page and you'll have several options to configure Net@address to meet your e-mail needs. Click the plus (+) sign next to Basic Services for links to various services that will help you manage your e-mail communications. Use the Collecting feature to collect messages from multiple e-mail accounts and forward them to your Net@address account where you can read them from one central location. To use this feature, your mail host needs to be POP3 (POP version 3). If you're unsure whether your existing account is POP3 compliant, check with your ISP.

For anyone who forgets birthdays or anniversaries, the Scheduling feature can be a lifesaver. Send messages to yourself or others on a one-time, daily, weekly, or even yearly basis to remind yourself of all those important dates, meetings, or appointments. It's easy to set up new reminders, and just as easy to deactivate ones you no longer want.

Like most Web-based e-mail providers, Net@address tries to eliminate unwanted messages from being accepted into your Inbox. The Junk Mail Blocker feature lets you automatically delete messages based on subject, sender, recipient, mail type, and/or mail receipt time.

lacy lavender Story Book, a South Seas Tiki Room, the Hotmail Classic dark blue, and many more.

**Address Book.** Do you e-mail the same people over and over again? If so, put their e-mail addresses in your Address Book. To add a name, click the Create New button and begin by filling in the Quickname box. This Quickname lets you quickly address messages without typing a full address. Next, type in the first and last name of the individual and an e-mail address or addresses for which this person can be contacted. You can fill in any other pertinent information for this individual as you see fit. When you are done, click the OK button to continue.

Once you've entered a name in the Address Book, place a check mark next to the name and click the Send Mail button. The Compose page will automatically pop up with the person's e-mail address already entered.

**Folders.** This screen shows all of the default folders. If you want to filter mail into special folders, click the Create New link at the top of

the page, type in the name of your new folder, then click the OK button. You can't delete any of the default folders, but you can delete and edit any folders you create.

**Options.** Options is divided into three categories: Your Information, Mail Handling, and Additional Options.

The Your Information section contains all of your personal settings, such as name, address, and password. Use these options to change personal info or your e-mail newsletter subscriptions.

Mail Handling contains the options to set up filters, block senders, and activate the Inbox Protector against junk mail.

**Additional Options** contain the three categories you will use most often, Signature, POP Mail, and Preferences.

If you'd like a signature block to appear at the bottom of all of your outgoing messages, click the Signature heading and type in what you want displayed. Be sure to click the Add Signature Box that appears on the Compose page, or

your signature won't be displayed.

You can choose to access e-mail messages from your ISP account by clicking POP Mail. To set up this account, you'll need to know the name of your POP server, your username, and your password. If you're unsure about the POP server name, check with your ISP. Some ISPs, like America Online, have third-party POP restrictions.

On the right side of the POP Server Settings screen are icons in different colors. Pick the color you want to indicate new mail. If you're accessing e-mail from several POP accounts, pick a different color for each to keep your Inbox organized.

Choose the Leave Messages On POP Server option to leave a copy of the e-mail message in the account it was originally sent to.

Use the Preferences options to control the number of e-mail messages displayed per page, your Reply-To address, and whether you want to include quoted sections in an e-mail message you're responding to. ■

Using your Net@dress Address Book, you can import or export addresses to and from other e-mail software including your Palm handheld computer. You can also send and receive attachments, as well as attach an e-mail signature block to all outgoing e-mails.

<http://www.netaddress.com>

■ **Yahoo! Mail.** Sign up for a Yahoo! Mail account and you'll get a whopping 6MB of free storage space. If you decide to use Yahoo! Mail and not give up your regular e-mail program, set your account to read Yahoo! Mail through Netscape Messenger, Microsoft Outlook, Outlook Express, or Eudora Pro. To do this,

access the POP Access & Forwarding feature from the Options link at the top of the page.

Yahoo! Mail also offers voice mail, but with a twist. By calling a toll-free number and entering your unique extension and 4-digit PIN (personal identification number; which you receive at sign-up) you can actually listen to your e-mail messages on the phone. Yahoo! Mail even lets you set up voice mail with a personal greeting in your own voice.

Using the same toll-free number, call in and get 20-minute delayed stock quotes, headlines, business, entertainment and technology news, the latest weather forecast, and sports scores. Don't worry about forgetting your access number or e-mail and voice mail options. Yahoo! Mail generates a nifty wallet-sized reference card with complete touch-tone phone instructions for you to print out.

While traveling, you can retrieve e-mail from up to three separate POP accounts. You can also forward Yahoo! Mail to any e-mail account or your pager or cell phone. It's easy to keep business and personal e-mail separate by filtering incoming messages into any folder you want. For example, you can set a folder to direct any e-mail with the word "Sales" into a Sales folder.

The Mail Preferences options let you choose the name you want to appear on your outgoing mail, the Reply-To e-mail address, the order in which you want messages displayed, the number of messages per page, and the screen width. You can also pick a new color scheme.

Like Excite, Yahoo! Mail provides virus protection as well as a SpamGuard that sends unwanted e-mail to the Trash Can.

If you decide to take a vacation and don't want to bother with your e-mail, then set up a vacation response message. Click the Vacation Response link in Options, choose the dates you'll be gone, type in the message you want to respond to your incoming e-mail, and click the Turn It On button at the bottom of the screen. Yahoo! Mail will automatically respond with this message to anyone sending you an e-mail message.

<http://mail.yahoo.com>

■ **Lots Of Pros, Few Cons.** Although a Web-based e-mail account may not have all the bells and whistles of your ISP, you have 24-hour, seven-day-a-week, global access to your e-mail. Whether you've flown to Paris for the weekend or are around the corner at a friend's house, your e-mail is only a click away. ■

by Nancy Hendrickson

Net@dress also supplies a Vacation Reply feature so you can create a message that will be sent automatically to all incoming mail received during the time you specify you will be away.

Although you can set preferences to configure your signature, the number of messages to display per page, and the name that will appear on your outgoing mail, you can't control color settings. However, you can use a nifty feature to track when you sent or received a specific message. The feature, called History, lets you view a historical summary of your incoming and outgoing e-mail by date, sender and recipient, or subject.

# E-mail On The Go

## Check Your Messages From Almost Anywhere



**T**he more we get, the more we expect. It's human nature, isn't it? Not long ago, e-mail was new and cool. And not long ago we were satisfied just to have the Internet available; type in a name, click a button, and bingo—dozens, maybe hundreds, of information opportunities were at our fingertips. We were downloading shareware, applying for loans, checking out vehicles, examining houses we might want to buy. It was incredible.

Then, of course, we started wanting more—that human nature thing again. We wanted e-mail on the go. We wanted everything the Internet had to offer, but we didn't want to be tied to a PC to get it. Fortunately, technology mirrors human nature—we want more, it provides more. Sometimes, in fact, technology is ahead of the curve.

■ **The Question Is Connection.** At one time, a simple telephone wire was all that was required to get you started. The fact that your PC sprouted a line out the back that ran to a small box on the wall wasn't something that was much of a concern. It just *was*. But busy people don't tend to stay put; they are constantly on the move. When it is necessary to be on the go, that unassuming wire connecting your computer to your telephone company's lines might as well be a long chain.

But the times, they have a-changed. It's a new century, after all, and there are new ways to take advantage of new technology.

Suppose you're away from home and you decide you would like to know who has sent an e-mail message to your computer. Once upon a time you had no choice but to wonder. Or you could call a neighbor to go get the key

from under the mat, log on to your server, and check your e-mail account. But these days you can check your messages without giving your neighbor—who you think is a little weird, in any case—privity to your domicile, not to mention your computer. Nowadays, you can check your e-mail messages by phone.

That's right, your telephone. You can actually have your e-mail messages read to you. To take advantage of this technology it is necessary to subscribe to a service, several of which are available on a trial basis at not cost.

■ **Dial Up Your E-mail.** One of the services available is E-mail Via Phone, available from SoftRunner (<http://www.emailviaphone.com>). Using E-mail Via Phone, which is also known as EVP, you can connect to your e-mail accounts using any touch-tone phone. Microsoft's text-to-speech technology is utilized to translate what your computer sees as words into what your ear hears as sounds. Therefore, a voice modem is a requirement if the program is to work on your computer.

There are a number of other features available as well. You can call and review your mail at your convenience, or you can choose to be notified at certain times, such as when you receive a new e-mail message. You can even set the system to screen e-mail content so you'll know immediately when your home office sends the specs on the new contract you're negotiating, but you won't be disturbed by some advertisement for some get rich quick scheme.

E-mail Via Phone does not replace your current e-mail program, and it lets you keep the account of your choice. With some services, you will have to use the account they specify, which means your e-mail address will change and you'll need to notify family, friends, and other contacts of the change.

The trial version downloads in about 30 minutes, and an installation wizard establishes the program on your computer quickly and easily. The program will search for your e-mail address and will ask that you verify it. You'll need to enter your e-mail password as well as a couple of other items of information. The wizard will advise you where to find specific information within your system and e-mail program. However, if you are unsure or are having trouble locating the information,

you can always contact your ISP (Internet service provider).

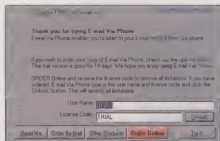
Also during the installation process you'll have the opportunity to configure EVP to your specifications. Now is when you decide what phone number EVP should call to notify you when you have messages; and how frequently, such as after a certain number of hours or after a specific number of messages have been received. Don't worry; these settings are not permanent. They can always be changed later, once you've worked with the system for a time and have your preferences sorted out.

In no time at all, EVP can be a part of your computer system—ready and waiting to alert you, according to the directions you've supplied, when you have e-mail. And then EVP will read it to you. So, you can be at work and know who is sending you messages to your home e-mail account, or, conversely, you can be at home and, if EVP is set up on your work computer, know what e-mail messages are coming down the pipeline to demand your attention when you get back to your desk.

**Monitoring to manage.** The idea of checking your work e-mail from home might not seem especially enticing. After all, who wants to deal with work when they are at home? But considering the volume of e-mail messages you may receive on a daily basis, letting a day or two go by without monitoring them can result in an almost overwhelming volume of correspondence when you do get to it. When you see, "You have 50 unread messages," aren't you beaten before you begin? Taking a few minutes to sort things out at home can result in better organization and efficiency at work.

E-mail Via Phone also offers caller ID and password support for more security. By default it answers all incoming calls, but you can control this feature from within the program's settings. You can specify the phone number from which you will be calling to check your e-mail, and EVP will answer only that number. Your work number, for example, can be recognized by EVP on your home system, so when you call to check, it will recognize you and report your messages. Other incoming calls, however, will not be affected.

The downside of E-mail Via Phone is that it does not work with Hotmail or any other Web-based e-mail account (including AOL) that does not support POP (Post Office Protocol) access. However, if you use Yahoo!, it is possible to open a free e-mail account with POP access, which can be done from the Options



**A trial version of SoftRunner's E-mail Via Phone is available for 14 days at no charge.**

section of your Yahoo! e-mail account. Click the POP Access & Forwarding link, select Web And POP Access, then click the Submit button. As EVP installs, you will need to use pop.mail.yahoo.com as your POP server, and add your login name and password.

If you should decide to keep EVP after your trial period, you'll need to pay the introductory price of \$29.95 for a single license.

Another available option is MailWatch Pro v1.2 (<http://www.zincware.com>), a program that promises to alert you upon the arrival of new messages, remove spam, and let you log on at any time to check messages. We were put off, however, by the \$79.90 price tag. And frankly, we didn't find the Web site too impressive. Still, it's always a good idea to investigate numerous options when you're shopping around.

■ **The Wonderful World of Wireless.** So now that you have figured out how to check your e-mail account on one computer while you are away from it, you are content, right? Maybe. Remember that human nature thing we talked about? It isn't enough, is it? Now you're going to want to monitor e-mail at other times, such as when you're on the road—literally.

No problem. The technology is there. Going wireless means a bit more of an investment, but the range of options that are available should assure a solution tailored to your needs.

One wireless

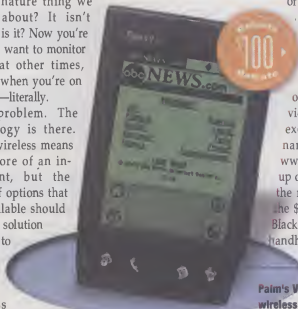
form of communication is the pager, which has been around for several years. If you have a device that lets you receive messages only, you have a one-way pager. With a one-way pager, you know someone wants to talk to you, but you have to find a phone from which to call.

If you have a device with you that sends and receives messages, you're carrying a two-way pager. Sometimes these devices are referred to as PICs (Personal Interactive Communicators). Lightweight and a little smaller than wallet-sized, PICs feature a flip-up display and small keyboard—a bit like a handheld PC—and they are battery powered.

With the two-way pager, you can receive and send e-mail messages. In order to communicate with a two-way pager, you'll need a device, of course, which can cost anywhere from \$149 on up, and you'll need a monthly service. Two-ways work by tapping into wireless networks, similar to the way cellular phones do. Some services are relatively cheap, starting at around \$10. Others are in the \$30 to \$40 price range.

One of the big names in two-way communications is Motorola. The Motorola Talkabout T900 2way PIC has been well received and reviewed. It is advertised on the Motorola Web site (<http://www.commerce.motorola.com>) for \$179 with a \$30 savings off the top and a \$50 mail-in rebate, bringing the total cost to \$99, at least for now. The Talkabout lets you send and receive messages, stores up to 70,000 characters, and supports an address book of up to 250 entries. Its single AA battery should keep it powered up for a couple of weeks.

Motorola's initial pricing of the T900 differs dramatically from the cost of other wireless e-mail devices already on the market. In interviews with busy corporate executives on the go, the name BlackBerry (<http://www.blackberry.com>) comes up often. This refers to one of the most popular devices in the \$400 and up price range. BlackBerry's RIM 950 wireless handheld lists for \$399 on the



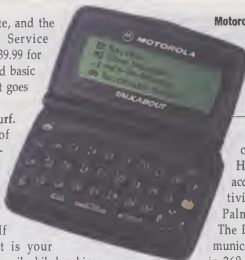
**Palm's Vix Handheld offers wireless Internet.**



company's Web site, and the RIM 957 is \$499. Service packages start at \$39.99 for flat-rate e-mail. Add basic paging and the cost goes to \$45.99.

**Surf from any turf.** With the advent of the wireless Internet, handheld computers and PDAs (personal digital assistants) take on new meaning. If time management is your thing and sending e-mail while lunching in a restaurant, browsing through book selections while waiting for your turn in the dentist's chair, or checking your stock portfolio while having your SUV serviced, is causing you to squirm with delight, just consider the possibilities.

The Palm Company, long a leader in handheld technology, offers upgrades to wireless connectivity for some handheld devices. The Minstrel V wireless modem, for example, enables a Palm V series handheld to access e-mail, reply to and send messages, and link to the Internet. It isn't cheap, though. At the Palm Store (<http://store.palm.com>), you can add the Minstrel V to your cart for \$369.



**Motorola's popular T900 PIC (Personal Interactive Communicator) lets you send and receive e-mail messages while on the go.**

Palm also has other options to offer. Its VIIx Handheld provides e-mail access and Internet connectivity when coupled with Palm.Net wireless service. The Palm.Net wireless communication service is available in 260 of the most populated areas of the United States. To see if it's available where you live, visit Palm's site (<http://www.palm.com/wireless>) and follow the Palm.Net Service link to the nationwide coverage map or click the Service Coverage link under the Palm.Net Subscribers section. Note that there are variations in coverage—some pockets offering both indoor and outdoor access, others offering outdoor only.

**Sell-ular or cellular?** Another route to the wireless Internet is through a cellular or digital telephone provider. With companies staking out territory, not all areas of the country have access to this service at present. So check with the cellular companies in your area to see what is available

now and what offerings they've slated to make available soon.

You can also visit Web sites of some of the big boys, such as AT&T Wireless (<http://www.attws.com>), for example. With AT&T's Digital PocketNet Premium Service, featured Internet sites, e-mail access, and a wireless personal organizer are available. The cost is advertised as starting at \$59.99 per month, and purchase of an Internet-ready phone may be required. As with all digital offerings, AT&T may not be available in your area.

**"All The World Over..."** You've seen those people in the television advertisements, flashing the V sign at you while someone sings "People Got To Be Free." The singer doesn't sound at all like Felix Cavaliere of The Young Rascals, but never mind that... you just wonder what Verizon is all about. What it is, is the combined forces of Bell Atlantic and GTE. What it can do is provide wireless Internet access, as long as it's available in your area of the country. Visit Verizon's Web site (<http://www.verizon.com>) and you'll find out in short order. With its considerable clout, Verizon promises to be a major competitor in the wireless Internet wars, and, if available where you live, you would do well to check it out.

Laptop users wanting to convert their unit into a wireless device can check out wireless modems. Once again, coverage area becomes a factor, as does cost. These wireless modems aren't cheap, starting at around \$280 for

## E-mail Access At A Glance

Device	Good For	Upside	Downside
Telephones	Checking e-mail via software or service	Free trials available, relatively inexpensive	Standard land lines not always available; some mail services not compatible
Cellular Phones	Checking e-mail via software or service	Free trials available, relatively inexpensive	No capacity to reply
Two-Way Communicators	Quick communications, when brevity is no problem	Lots of competition gives consumers many choices	Limited coverage areas; limited text possibilities; more costly; service needed
Palm PCs, PDAs, Handhelds	Basic computing, communicating, and e-mail monitoring	Easy to use; lots of possibilities	Price; may not be considered cost-effective
Web-Based Cellular Phones	Checking and replying to e-mail messages	Relatively inexpensive	Difficult to read; very slow
Wireless Modems	Converting laptops to wireless devices; also some PDAs	Available for several devices	Something else to carry; costly and slow
Wireless Services	Checking e-mail while at participating airports, hotels, motels	Quick and easy; good service reports	Lack of universal availability
Satellite Devices	Keeping in touch from just about anywhere	Practically world-wide coverage	Much too specialized and costly for general use

Novatel's Wireless Merlin (<http://www.novatelwireless.com>) on up to \$400 for its Wireless Sage IP. And that doesn't include the service plan that wireless modems require, which can likely add another \$40 to \$50 per month.

Wireless modems utilize CDPD technology—that's Cellular Digital Packet Data, a network engineered specifically for wireless data transmission. Since it's wireless, no physical connection is necessary. No more hunting up a phone jack and asking politely if you can use it. One drawback to the network, however, is its speed—or, rather, lack thereof. Speeds as slow as 19.2 Kbps (kilobits per second) are presently about as fast as you're going to get.

Launching while lounging or lunching. Certain providers have focused on a wireless niche and have attempted to establish themselves accordingly. Realizing many business professionals travel by air, and that waiting time in airports, hotels, and motels is often a good chance to catch up on mail and communication, MobileStar Network Corporation has introduced a network service at several air terminals throughout the country. With the purchase of a Proxim RangeLAN2 PC Card (around \$295), your laptop will be configured to utilize MobileStar's network at airports where available. With this service, a three-hour layover can easily become three hours of productive time. For more information about the MobileStar network, visit the company's site Web site at <http://www.mobilestar.com>.

There are some CDPD-enabled cellular phones on the market, but they haven't been well received. For the most part, they do not operate efficiently and are difficult to read.

Wireless technology, keep in mind, is still in its infancy. Many protocols have yet to be established, many applications have yet to be introduced. Manufacturers are still testing markets and consumers are investigating needs. We have not reached the point, yet, where we have the device that does it all.

But suppose you could link two devices, wirelessly of course, to accomplish one task. Short-range wireless linking is the concept behind what has come to be known as Bluetooth technology. It is basically a radio technology that permits units to work without being physically connected. A wireless printer is an example, or a PDA you can hot synch to your PC without actually connecting the two.

Bluetooth works when units are close to one another. Some PDAs and laptops are beginning to ship with the technology built in, and as costs come down, Bluetooth is sure to have an impact in the wireless revolution.

■ **Satellite Stats.** Everyone knows there are satellites floating around in space, and they've been up there for years. They bring us weather reports, cool jazz, up-to-the-minute

#### Satellite Phone Home page



Example: you are in a remote village in Africa, and you have no other choice but to use a satellite phone. If you are in a vehicle or on foot, you wonder, "How will I find and receive mail, news or call home?"

The Satellite Home Page provides information on satellite phones and how they work. Check out its Web site at <http://www.mafalink.org/Sat/Index.htm>.

positions of the planets, and even the World Federation of Wrestling.

It's possible to also take advantage of satellite technology on the go with the latest generation of satellite phones. Think of satellite phones as picking up where cellular technology stops.

Worldwide coverage is a distinct possibility. Globalstar Phone Service (<http://www.globalstar.com>) should pretty much cover the map—that's the world map—by the end of 2001. Inmarsat Satellite systems (<http://www.inmarsat.com>) currently provide about 98% of global coverage. The advantage of satellite access, obviously, is that it's going to be available just about where you are.

Yet, there are some disadvantages to satellite technology. For starters, satellite reception needs a clear path. If you have a dish television system, you know what can happen during a heavy rain or snowstorm. With the dish receiving physical interference, reception suffers and may even fail completely.

When talking mobile reception, the problem is the cost. True satellite phones aren't cheap. In fact, even a basic satellite phone is going to set you back a couple hundred dollars. If you need e-mail access and additional features, you'll

need to fork over a few more hundred dollars. Therefore it is unlikely the average consumer will embrace the full spectrum of satellite technology anytime soon.

Still, if you're going on safari, planning an expedition to the North Pole, or thinking about a trek across the Gobi desert, there are devices that will let you stay in touch. A mere \$2,495 will purchase Outfitter's WorldPhone (<http://www.gpsphones.com>), which is billed as the world's smallest portable voice, fax, and data communication center. We're told that using the device is as easy as placing a phone call from home. The cost of the phone isn't the only consideration, however, for there's also a per minute charge, which starts around \$2.45.

Outfitter also has a Global Satellite Communicator, the GSC 100, which will give e-mail access from anywhere you are likely to need it. It is available for around \$1,200. Users pay a one-time activation fee of \$49.95 and a monthly fee of \$29.95. Additional charges are based on a per-character fee of one cent per character after the first 10 messages.

Even though satellite e-mail monitoring is not for everyone, it is nice to know it is available. And if prices follow the normal trend that takes place with technology, eventually costs should work down to levels affordable to more of us.

Remember the timelines you studied in school that showed man really hasn't been on Earth all that long? Well, if we could construct a timeline of computer technology on Earth, the wireless revolution would be barely a blip at the end. Exactly how it's all going to shake out is anybody's guess right now. But a couple of things are certain—consumers have a wide range of options available, and when it comes to being wireless, things are just getting started. Technology creates opportunity. Opportunity creates entrepreneurs. Entrepreneurs create companies, and companies need customers. If you're a consumer wanting more (and who isn't?), now is a good time to be alive. [E]

by Michael McAllister



Satellite Phones Direct advertises 24/7 customer support and top quality, brand name satellite phones on its Web site (<http://www.satellite-phones-direct.com>).

# Opening & Sending Attachments

## No Pushing, Pulling, Or Shipping Charges Involved



**E**-mail attachments are like passengers that hitch a ride across the Web to a message's final destination. Attachments are basically just the electronic counterpart of a document or photograph you enclose in a letter, and you can attach virtually any type of file to an e-mail, including EXE (executable) files, which open another program. Users typically send text document attachments, but you can also send graphics files, photographs, audio and video files, databases, spreadsheets, and programs such as games, utility packages, and application software.

If you've ever received an e-mail from a friend and wondered how to open the attached file she swore was so funny or tried to send your parents a picture of your new baby as an attachment to an e-mail, read on to learn how. You'll be amazed by how much this knowledge will increase the usefulness of the already useful e-mail.

ment, but it may help to clarify what you're sending to the recipient.

To send the attachment, click the paper clip icon in the message's task bar. (You can also choose File from the Insert menu.) In the Insert File dialog box, locate the file you want to attach and double-click it or select the file and click the Insert button. That's it! Your attachment now appears in the e-mail you want to send. Just click Send, and the e-mail is on its way with your attachment in tow.

It's just as easy to send an e-mail attachment with Eudora, another popular e-mail application. Begin a new e-mail message as you normally would by clicking the New Message icon and typing the recipient's address and a subject and message (if you want). To attach a file to the message, click the Attach File icon (the one with a paper and envelope paper clipped together). You can also choose Attach File from the Message menu. Now, locate the file you want to

attach in the Attach File dialog box, select it, and click Open. (Alternately, you can just double-click the appropriate file.) You will now see the path of the attached file in the Attached line of your message. All you have to do now is click Send, and the attachment is on its way.

■ **The Key To Opening Attachments.** Perhaps even more important than knowing how to send an attachment is knowing how to open one. After all, you don't want to have to admit to a business associate that you don't know how to open the file they sent. As with sending an attachment, the process of opening an attachment differs slightly depending on what e-mail program you use, but the basics are pretty much the same.

You will know when you have received an e-mail with an attachment in Outlook because you will see a paper clip next to the new e-mail in your Inbox. You will also see a yellow paper clip in the top right corner of the Header Information in the Preview Pane (if you have selected Preview Pane from the View menu). There are two ways you can open the attachment. One option is to click the yellow paper clip and choose the attachment you want to open from the pop-up menu. You can also just double-click the e-mail and then double-click the attachment you want to open. Note that opening files directly, as opposed to saving them first, can cause problems. We'll talk more about this later.

This process is very similar in Eudora. A paper and paper clip icon next to incoming e-mail will tell you that you have received an attachment. Eudora displays the actual attachment in the body of the e-mail, which you can see by double-clicking the e-mail or just looking in the lower half of the Eudora In screen. Double-click the attachment to open it.

■ **Why Won't it Open?** While the actual process of opening an attachment is simple, you may still run into problems if your computer doesn't have the program it needs to open the file. Most computers come equipped with the programs you will need to open most text files and many word-processing files.

**Graphics files.** Opening graphics files, however, is a bit more difficult because your computer isn't as likely to already have the program you need to open these files automatically.

For example, Windows comes with a program called Paint, which will automatically open BMP (bitmap) files, but to open many

other types of graphics files, you'll need a program such as Adobe PhotoShop.

If you receive a graphics file attachment (they usually have extensions such as .BMP, .GIF, .TIF, or .JPG), and your computer won't open it automatically, you have a couple options. You can try opening it in Microsoft Word by saving the file (right-click it and choose Save As from the pop-up menu), opening Word, and clicking the Insert menu. Then select Picture, From File and locate the file you just saved. Double-click it to see if it will open in Word so you can view it. If that doesn't work, you'll want to get a program such as Paint Shop Pro that is instantly compatible with 35 different graphics file formats.

EXE files. If you attempt to open or run an EXE file and it fails, the problem may not be with the file itself. If your computer is part of a network, your network administrator may have restricted your ability to open these files because they can carry harmful viruses. If there are no policies or security measures preventing you from opening these files, and the file still fails, the problem is probably in the file itself or the transfer process. In other words, the file may have been corrupted en route to your computer. Sending files across the Internet is not an exact science, and file corruption is common. If the executable file fails, ask the correspondent to resend it. If it fails again, the correspondent's original file may be corrupt.

**■ Safety in Saving.** When you double-click to open an attachment, especially a graphics or EXE file, Outlook will usually display a dialog box that asks you if you want to open the file or save it. Eudora automatically saves every attachment in the C:\EUDORA\ATTACH directory, so you can click the attachment icon or access the file from this folder to open it. We suggest that if your e-mail program doesn't automatically do it for you, you should always save EXE files to your hard drive before you open them because these files can contain anything, including macros or programs that can hang up or collapse your system, and this can do further damage to a network if your system is part of one. Typically, executable files are safe and cause no problems, but it's better to

take precautionary measures than disable your system or an entire network. Text files, graphics files, and Web pages aren't as likely to affect your computer, but it's safer to save them first, as well.

Simply create a separate folder for these files, save them there, and then open them from that location. Confining these files will not necessarily contain a virus, but limiting these files to a single folder will make it easier to delete the files if you have any problems.

### ■ Bigger Isn't Always Better.

Despite the occasional hassle you may encounter with attachments, they really are convenient and easy to use. In fact, the only real limitation of e-mail attachments is size. Most ISPs (Internet service providers) and LANs (local-area networks) have a maximum file size limitation on their servers, which means that you won't be able to send some files if they exceed a certain size. This protects

the Internet from bottlenecks that could slow or collapse the system.

Most ISPs limit the size of files you can send to 5MB. In most cases, if you attempt to send an e-mail larger than 5MB, one of the many servers on the Internet will reject your file and bounce it back to you with an error message telling you the file is too big. Within these limitations, your e-mail, which includes the message plus the attachment, actually cannot exceed 3.5MB because the system attaches additional data instructions and programming such as headers to your e-mail, which increases the size of that 3.5MB file to 4.9MB, the maximum transferable volume. If you work in a networked office, you may have file size limitations even smaller than 3.5MB because your company may have policy restrictions on files to prevent degradation or collapse of the internal network.

**Use a different format.** There are ways to get around these limitations. If you are sending a photograph or a graphic that exceeds 3.5MB such as TIFF (Tagged Image File Format) or EPS (Encapsulated PostScript) files, which are typically huge, you can open these files in Photoshop, Paint Shop, or another photo manipulation software program and resave them as JPEG (Joint Photographic Experts Group) files.

JPEG files use file compression, which decreases the overall file size by reducing the number of pixels in the image. It actually economizes the way data is stored because it identifies and then discards the "extra" data the human eye cannot see. For images that will not be published or reprinted in photo-quality format, this option is an easy solution.

**Zip it.** If, however, the graphics or photographs you are attaching require photo-quality reproduction, your next option is to zip (compress) the files using a zip utility such as PKZip, WinZip, WinRAR, or WinAce before sending them. These are all shareware programs that you can download from the Internet free or for a minimal fee.

PKZip (<http://www.pkware.com/catalog/pkzipw40.html>) from PKWARE is a compression utility that also comes with multiple signature support. This feature lets a group of users digitally sign an archive and its contents (this is great for legal documents), which lets others know if someone has tampered with the archive. PKZip also comes with virus scan and lets you set up to nine compression levels.

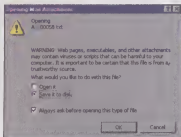
WinZip (<http://www.winzip.com>) has a very user-friendly wizard that walks you step-by-step through the process of zipping or unzipping files, and it lets you e-mail the selected zipped file directly to your recipient from the wizard screen. WinZip can zip a 10,150KB file (that's over 10MB) down to 580KB. That's a reduction of 9,570KB, or just over 9MB. The file is now less than 1MB, which you can easily e-mail to any recipient in your address book.

RARSoft's zip utility WinRAR (<http://www.rarsoft.com>) supports Unicode in file names, which is helpful for unzipping archived files with special characters. In addition, it has foreign language versions that support documents in German, Slovenian, and Italian.

WinAce (<http://www.winace.com>) supports 11 different countries' languages in addition to English, and it offers self-extracting archives, multiple-disk archives, password protection, comments, virus scans, and variable compression.

**Additional programs.** If these programs don't meet your needs, visit <http://www.keyscreen.com/filemang.htm#2> for a site that lists 58 additional shareware zip and utility file programs with links directly to the home page or the download page of each product.

The free Adobe Acrobat Reader (<http://www.adobe.com>) can easily compress multimedia files, which are files that include graphics,



**It's a good idea to save EXE files before opening them. This will help protect your computer from harmful viruses or codes the file may be carrying.**



text, and spreadsheet tables all in one document, such as those created by PageMaker, Quark Xpress, or Adobe InDesign. You can download this software for free to view Acrobat's compressed PDF (Portable Document Format) files, but you must purchase the software to create these files.

### ■ The Feel Free To Get Attached.

E-mail attachments are a quick and easy way

to disseminate multiple documents to many people. One memo can reach a thousand desks in seconds, and one corporate announcement can circle the globe in less than a minute. There is no mystery to this process. Anyone can send or receive any file across the Internet, and with e-mail confirmation, know that their recipients received the message and at least opened it. That sure beats anything postal mail can promise.

Just remember that file size, corporate policies, and opening attachments directly from the message are all important factors to consider before you proceed. If you have the compatible software for your attachment file associations and you practice caution in your efforts, you should have no problems with e-mail attachments. **ES**

by Julie Sartain

## File Types

The following chart lists some common file types. Many of these formats are cross-compatible with other software programs. For example, Adobe PhotoShop and Paint Shop Pro support nearly all of the graphics formats. Excel, Lotus, and

Quattro Pro are all interchangeable, and text files will open in any word processing program.

If you receive an attachment you cannot open, and you want more information about the file format, visit the Almost Every File Format In The World Web site at

<http://www.ace.net.nz/tech/TechFileFormat.html>. This site offers an alphabetical list of many file formats. If you click the letter S for example, the site lists file extensions that begin with S, including a definition and information regarding this format. If

the format you are looking for is not listed here, try typing file formats in the search box of your favorite search engine. The Internet has hundreds of Web sites with this information. ■

File Types	File Extensions	File Types	File Extensions	File Types	File Extensions
Adobe Illustrator graphics files	.AI	JFIF graphics files	.JIF	SciText Continuous Tone graphics files	.SCT
Amiga files	.IFF	JPEG (Joint Photographic Experts Group) files	.JPG	SGI Image File image files	.SGI, RGB, RGBA, BW
Animated Cursor animation files	.ANI	Lotus 123 spreadsheet files	.WK1, .WK2, .WK3, .WK4	Sound files	.WAV
Animation Shop animation files	.MNG	Macintosh PICT picture graphics files	.PCT	Sun Raster Image files	.RAS
ASCII text files	.TXT	MacPaint graphics files	.MAC	SYLK (Symbolic Link) file format	.SLK
Autocad Drawing graphics files	.DWG	Microsoft Access database files	.MDB	TIFF (Tagged Image File Format) graphics files	.TIF, TIFF
Autodesk animation files	.FLC, .FLI	Microsoft Paint bitmap graphics files	.MSP	Truevision Targa graphics files	.TVA
Comma Separated Values text files	.CSV	Microsoft PowerPoint presentation files	.PPT, .PPS	Video for Windows video/animation files	.AVI
CompuShow GIF (Graphics Interchange Format) files	.GIF	Microsoft Word document files	.DOC	Web Page Internet files	.HTM, HTML
DIF (Data Interchange Format) text files	.DIF	Paint Shop Pro graphics files	.PSP	Windows Enhanced Meta File graphics files	.EMF
dBase database files	.DBF	PC Paint graphics files	.PIC	Windows Meta File graphics files	.WMF
Deluxe Paint graphics files	.LBM	Photoshop graphics files	.PSD	Windows/CompuServe RLE files	.RLE
Dr. Halo bitmap graphics files	.CUT	Portable Bitmap graphics format	.PBM	Windows/OS2 Bitmap graphics files	.BMP
Encapsulated PostScript files	.EPS	PNG (Portable Network Graphics) files	.PNG	Windows/OS2 DIB graphics files	.DIB
Excel spreadsheet files	.XLS	Portable Pixel Map graphics files	.PPM	Word for Macintosh document files	.MCW
Freelance Graphics presentation files	.PRE	Postscript files	.PS	WordPerfect Bitmap graphics files	.WPG
GEM Paint bitmap graphics files	.IMG	Quattro Pro spreadsheet files	.WK1	WordPerfect document files	.DOC
Harvard Graphics presentation files	.SH3	Raw File Format files	.RAW	Zsoft Paintbrush graphics files	.PCX
		Rich Text Format text files	.RTF		

# Voice, Video & E-mail

## How To Make A Good Thing Even Better



**T**he majority of e-mail messages sent today are plain-text messages, but an increasingly popular way to literally say "hello" and much more via e-mail has nothing to do with plain text. Users are discovering how easy and fun it is to include video and voice with e-mail. We'll show you how to add your own voice and video touches to your messages.

■ **The Basics.** To get started sending voice and video e-mail, you will need a Web camera, microphone, and sound card. You can use a camcorder instead of a Web camera, but this is more complicated; the Web camera is the easiest and cheapest choice. The microphone can be a combination headphone/microphone or a standalone computer microphone.

You will also need some sort of software that works with the recording hardware to create your voice and video files. Your computer

probably already has a basic application you can use. Click Start, choose Accessories, and select Entertainment, Sound Recorder. Use the controls in the Sound Recorder dialog box and the microphone to create a simple WAV sound file that you can attach to an e-mail. To add a video clip, use the recording software that came with your Web camera to record your video clip and then attach the file (usually an AVI file) to your e-mail.

If you want a program with more features than your PC's basic application offers, consider a third-party program. In most cases, you can download these programs from the Internet and use them with common e-mail clients such as Microsoft's Outlook or Qualcomm's Eudora. Once downloaded, these programs are easy to install on your computer, but if you don't want to hassle with downloading and installing a program, try a Web-based solution. Some sites provide the resources for

you to create multimedia e-mail; you simply register at the site, download a few files, and create the video and voice files you want to add to your e-mail. We'll discuss several examples of such programs later in the article.

**File attachments.** In addition to having the right hardware and software on your system, you'll want to know a little about sending files as attachments to e-mail messages. Not too long ago, sending a video file as an e-mail attachment proved to be a cumbersome task: Both the sender and the receiver had to use the same software program to record and then play the video file. Users can avoid this problem by saving the video they want to send as an EXE (executable) file. EXE files, which are also called program files, can run by themselves. That means a user simply clicks the file and it will play automatically, no need for special software.

AVI (audiovisual interleaving) is another popular format in which to save video files. To view AVI files, however, you must have some sort of an AVI file player, such as Windows Media Player, on your system. You can access the Windows Media Player by clicking Start, Programs, Accessories, Entertainment, Windows Media Player. (For information on opening and sending attachments, see the article on page 122 of this issue.)

■ **Software Options.** There are many choices for software that will help you record, save, and send video and voice with your e-mail messages. We've included a few here, along with step-by-step directions that will get you from start to finish.

**VideoLive Mail.** VideoLive Mail (<http://www.gocyberlink.com/english/products/vlm/vlm.asp>) from CyberLink is an example of a third-party program you can download from the Web. It is compatible with both Microsoft's Outlook Express and Qualcomm's Eudora, two of the most popular e-mail clients. With VideoLive Mail, the recipient of your messages doesn't need any special software to view video e-mails.

After you've downloaded and installed the program, you're ready to begin. The first time you run VideoLive Mail, the Setup Wizard will ask you what kind of setup you want to perform. Click Yes for a no-frills setup. The configuration procedure consists of viewing a series of dialog boxes and pressing the Next button. These dialog boxes help you determine if your Web camera, speakers, and microphone are working properly. They also

let you adjust such things as the frame rate (the higher, the better to capture motion) by moving a sliding scale.

When configuration is complete, you're ready to record. Here you'll have some help with the Recording Wizard. Like the Setup Wizard, the Recording Wizard walks you through a series of dialog boxes about what buttons and sliding scales to move to get the best quality. When you're finished with these adjustments, click the Record button, and a status box will appear that outlines the video you are recording. Click Stop to end the session. When you're done, the last dialog box presents buttons you can click to play, save, or mail your recording. You can click Play to review what you have recorded.

You will have three choices for incorporating video and voice into your e-mail: a message containing audio and video, a message containing only audio, or a message containing only video. Mailing the video or voice recording is as simple as opening another dialog box and filling in some information, such as title and author. Another dialog box will open; press OK and include mailing information. VideoLive Mail automatically attaches the video and audio to an e-mail.

You can buy VideoLive Mail right away for \$39.95 or download a free 30-day trial first. To use VideoLive Mail, you'll need a 166MHz or higher Pentium processor with 32MB RAM, a 16-bit sound card, a microphone and speakers, a Web cam, and Windows 95/98 or higher.

**VisualizeMail.** If you don't want to download any special software on your computer to send video and video e-mails, there is an alternative. VisualizeMail (<http://www.visualizevideo.com/products/mail.html>) is a Web-based video e-mail service from Visualize Video. To create and send video e-mail, you set up an account that works in conjunction with one of your existing e-mail accounts. The VisualizeMail account houses all the video and voice files you capture so you don't have to worry about making room for them on your computer.

And that is one of the neat things about VisualizeMail: The company hosts the video, so there are no large file attachments to send. In fact, if you've used a Web-based mail service such as Hotmail or Yahoo! Mail, you'll be comfortable with VisualizeMail. The main difference between VisualizeMail and Web-based e-mail clients is that VisualizeMail includes VCR-like controls such as Record, Stop, Play, and Save that let you add voice and video files to your e-mail messages.

Before you can start using VisualizeMail, you must create an account. Click Sign-Up Now! from the VisualizeMail home page. After completing the form on the following page, click Sign Me Up. You will see your user information, including your password and your complete e-mail address. Keep this information safe for future reference.



**Say goodbye to boring, text-only e-mail with VideoLive Mail, a third-party program you can download from the Internet to help you send voice and video with your e-mail.**

With VisualizeMail, you can record audio and video or audio only. To create a message with video, click the Create vMail link. Use the Record, Stop, Play, and Save buttons to make the video or voice file. Once you've addressed and completed the message, just click Send. VisualizeMail uploads your file to its servers and stores it there. When your recipient gets your e-mail, he will see an HTML (Hypertext Markup Language) message telling him that he has received a video or voice message. To see it, he only has to click the link embedded in the text message. The link will take him to the Web page containing the video or voice message.

Currently, VisualizeMail only works with Internet Explorer 4.0 and above. A version for Netscape browsers is coming soon. Other system requirements include Win95 or higher, a USB (Universal Serial Bus) Web camera, Windows Media Player version 6.4 or higher, a 266MHz processor or higher, 32MB RAM, a Windows-compatible sound card, a microphone, speakers, and a 33.6Kbps (kilobits per second) or higher Internet connection.

**Picante Pro.** This program from Picante Communications (<http://www.picanteorp.com>) goes beyond letting users just send video and voice e-mails; it also lets users incorporate Excel spreadsheets, Word documents,

and PowerPoint presentations, all without using attachments. Picante Pro works with any e-mail client, and anyone with a browser can read a Picante Pro e-mail; no special software is required.

Picante Pro is similar to VisualizeMail in that it does not include attachments. This is an advantage for the recipient of the e-mail. Instead of having to open separate e-mail attachments to view video or voice files that may require different programs to read, the recipient receives a Picante Multimedia E-Mail message that opens with all the multimedia elements live within a single page. For example, the recipient may open an e-mail birth announcement to see a photo of the baby with a label announcing the news. Clicking the audio button plays the sound of the baby's first cry and the proud parents' greeting.

To get started, download the program to your hard drive, click Setup, and simply follow the instructions in the dialog boxes. Once installed, open Picante Pro by clicking Start, Programs and selecting it from the menu. After Picante Pro loads, you can either insert multimedia files (such as video, voice, PowerPoint, or Excel files) you have already created and stored on your computer or use Picante Pro to create a brand new file to send in an e-mail. Click the Post button when you're done.

This will load an Outlook message in which you can insert e-mail addresses, change the subject, and add a text message to the Picante Pro message. If you have a different e-mail client than Outlook, Picante Pro will load your personal address book, and you will be able to select the recipient of the multimedia e-mail directly from your address book.

In order to use Picante Pro, your computer should be running Microsoft Outlook, Outlook Express, Eudora, or Netscape Mail. In addition, you need a Pentium processor with at least 16MB of RAM, 5MB of hard drive space, and Win95/98/Me/2000/NT.

#### ■ Sound & Video Is The Spice Of E-mail.

While no one is arguing that plain-text e-mail isn't useful and effective by itself, adding voice and video to these plain messages is something many people will have a hard time turning down. If a picture is worth a thousand words, make your e-mail messages even more valuable by adding voice and video clips that will delight your recipients. [E]

by David Noack

# Mind Your (Online) Manners

## How Good Is Your E-mail Netiquette?



**A**mong the many things the Internet has changed is the way we communicate. E-mail has made it possible for a person who lives in a small town in Missouri to communicate with someone in Australia or Thailand on a daily basis. And this communication is much faster and easier than more traditional forms of communication, such as postal mail and telephone calls.

The popularity of e-mail has led to the formation of a new sort of society: groups of people who "know" each other without ever having met in person or people who know each other on a face-to-face basis but communicate primarily through e-mail. Just as traditional societal groups follow certain codes of conduct, e-mail interactions are governed by rules of etiquette. Even if you only e-mail

people you know on a face-to-face basis, it's still important to understand these rules because you are still a member of the online community. We'll look at some points of protocol you should keep in mind as you fire e-mails to your friends and colleagues.

**■ What Is Netiquette?** The term "netiquette" is a combination of the words "Internet" and "etiquette," and it refers to the unwritten rules of Internet courtesy. This is a set of guidelines for proper manners when communicating with one or more persons through the Internet.

Many people don't realize that netiquette is an important aspect of communicating through e-mail. And it's certainly easy to understand why. The anonymity that e-mail

affords tempts many people to say certain things and in such a way that they wouldn't do under normal circumstances. As with any society, however, members of the e-mail community should follow certain rules to ensure that the experience is pleasurable for everyone.

### ■ If You Wouldn't Say It, Don't Type It.

One of the easiest ways to make sure you're observing the rules of e-mail netiquette is to behave just as you would in any other situation or relationship. When talking to someone face-to-face or even over the phone, people tend to be more polite because it's harder to be rude in person. E-mail affords more opportunities for being rude than face-to-face conversations or even over-the-phone communications because it is more removed and, in some cases, anonymous. Take care to avoid this temptation; you could find yourself with no one to e-mail.

Further, sometimes in normal conversation a person will misinterpret what someone else has said and be offended by it. This can happen in e-mail conversations, too. The same rule applies to both circumstances: Before overreacting and saying or sending a heated response, look a little closer at the remark. Give the person the benefit of the doubt and assume first that you just misunderstood what she was trying to say. This could save you both from an unnecessary quarrel.

**■ Watch Your Tone.** It's important to remember that e-mail communications force both parties to rely on writing rather than speaking. This brings up an important aspect of e-mail. People communicating through e-mail can only read what others have written; they can't interpret a person's tone or read that individual's body language, two important characteristics that help relay meaning in conversation.

Without body language or tone of voice, it's easy for someone to totally misinterpret a message, so before sending a message, it's a good idea to reread it. This will help you determine if it gets the right message across and alert you to any problems you didn't notice before. It also gives you a chance to change any words that don't quite say what you want.

**Time is on your side.** While we're on the subject of rereading your messages, we should mention that this is one of e-mail's greatest strengths. When you talk to someone face-to-face, you don't really have a good opportunity to mull over the exact words you will use for each response; spoken conversation demands



quicker responses than that. With e-mail, however, you can take more time to carefully compose your responses, rereading and editing as you go.

This advantage proves even more helpful when you don't know how to respond. Instead of looking foolish and stammering around for the right words, you can take your time carefully crafting just the right answer. Unfortunately, many people squander this advantage by firing back replies in the heat of the moment, which violates the following rule of netiquette.

■ **Keep Your Cool.** Count to 10 before you send. You've heard that counting to 10 is a good way to rein in your temper so that you can rationally deal with a problem at hand. If you receive an e-mail that makes you angry, it's rarely a good idea to type and send the first message that comes to mind. Get your emotions under control so you can think of an appropriate way to deal with the situation instead of sending a response you'll regret.

The regret you feel may be amplified by the fact that e-mail is more permanent than the spoken word. You never know how long that e-mail will hang over your head or who may end up reading what you wrote. In addition, an antagonistic response could start a flame war, which is the result of several argumentative or rude messages. While this most often happens in Internet chat rooms, some individuals may harass others via e-mail in the same manner. Such messages are annoying and offensive. If you receive an insulting message from someone else, trash it so that the negativity ends right where it started; sending a response encourages the other party to continue the flame war.

■ **A Little Privacy, Please.** If you're like most people, you are probably defensive when it comes to your privacy. You wouldn't want someone to rummage around and read the letters in your mailbox, and the same applies to the e-mail in your inbox. Respect others' privacy by not reading the e-mail they didn't intend for you. Of course, the privacy of your e-mail account at work is a different matter. Different companies feel differently about this, so you'll want to learn how your company deals with this issue. Another exception may be the privacy policies in parent/child relationships.

**Addresses aplenty.** An area where privacy really comes into play is in forwarding messages. Many people like to send jokes and other entertaining messages to friends and

family members, but these messages often contain the e-mail addresses of everyone who has received that message as it has been forwarded from person to person. Not only is this annoying to the people who have to scroll down past hundreds of names and loads of IP information to get to the actual message, it's also a violation of others' privacy.

Many users don't want their e-mail address sent to many different people, many of whom they don't even know. If you plan to send a joke or another message that you received from someone, copy and paste instead of forwarding. Simply copy the joke from the message, paste it into a new e-mail, type the addresses of your intended recipients, and send the message on its way. The recipients will appreciate your efforts.

■ **BTW, Ain't You Going To Write Me No More?** Another thing that sets e-mail communication apart from face-to-face communication is the fact that you can't see the person with whom you're communicating. This means that you can't learn anything about who that person is and how he lives by his physical appearance. What you can judge him by, however, is his writing ability.

To be fair, e-mail is a quick form of communication that has more or less adopted its own set of grammar rules. These rules aren't as strict as conventional rules of grammar. For example, many people have adopted the use of abbreviations to represent the words they are saying, such as BTW, which stands for "by the

way." This saves the time of typing the whole phrase, but you should use it sparingly if you aren't sure the recipient knows what these abbreviations mean. It's also common for users to drop conventional salutations, such as "dear" and "sincerely" in e-mail.

Even with these exceptions to conventional rules of grammar, though, you should use the spell check feature to help you keep your e-mail as error-free as possible. You should also reread your messages (as we mentioned earlier) to ensure that what you've written makes sense. Not only will this make reading your e-mail more enjoyable for the recipient, it will also cast a better light on you.

If grammar isn't your strong point, you can at least remember one thing: A definite no-no in the way of online communication is sending messages in all caps. Not only does the caps feature make the message extremely hard to read, but words take on a bolded quality that make them seem as though the sender is YELLING at the reader. Instead of highlighting words by using caps, try quotation marks as a method of enhancing online speech.

■ **Mom Would Be Proud.** Mother always said, "Mind your manners." This pearl of wisdom reminds people of the need for proper behavior, even in e-mail messages. Just remember to respect others, and you'll have gone a long way toward observing the rules of netiquette. [E]

by Karen M. Spring

## Express Yourself With Emoticons

**B**ecause e-mail cannot demonstrate tone, facial expression, or body language, many users insert emoticons (groups of letters, numbers, or punctuation that form a facial expression) in e-mail to help convey their message. The

word "emoticon" is a combination of the words "emotion" and "icon." Scott Fahlman, a computer scientist, created the first such symbol, which became known as the classic smiley, around 1981. The word emoticon was not coined

until some time after that.

Below, we have listed some other popular emoticons and their meanings. Of course, there are many variations of these emoticons. See if you can come up with some of your own.

:)	Classic smiley
:x	Kiss
8-O	Astonished look
:D	Happiness
:Q	Confusion
:(	Unhappiness or a frown
:/	Skepticism
;) )	Winking

B-)	Wearing glasses
=):-)=	Abraham Lincoln
@>—>—	Long-stemmed red rose
+(-I-)	Knight
(8 l)	Homer Simpson
*(:o>	Santa Claus
P-)	Wearing a baseball cap
P-)	Pirate

# E-mail Protection

## Learn What It Takes To Keep Your Messages Safe



**L**ike most technology, e-mail is not inherently bad. In the wrong hands, however, e-mail can take on an almost evil tinge.

Viruses borne on e-mail attachments have erased more than a few hard drives and clogged up network servers around the world. E-mail messages can also carry hyperlinks that, once clicked, open suspicious Web pages with malicious intent. Placing blind trust in the security of e-mail can lead to embarrassing or even financially disastrous situations when messages circulate beyond their intended recipients.

All in all, the convenience of e-mail carries a price tag in potential trouble for the unwary. Fortunately, however, the bulk of e-mail boondoggles can easily be averted. Learn a little about the lurking dangers, and you'll be able to avoid most any trouble.

■ **Computer Health.** As with the viruses that afflict humans, computer viruses often appear suddenly and usually as part of a larger pattern of plagued victims. Rather than travel through the air or via contact, computer viruses prefer to use the medium of e-mail as they ramble from one luckless host to the next. In

their wake these nefarious bits of code leave flummoxed users and damaged data. As wireless and handheld computing takes off, virus creators have even begun to target Palm devices and Pocket PCs.

Whatever their favorite haunt, viruses can be divided into a few main flavors. All are nasty, but some represent special meanness on the part of the virus creator. A true virus can only move from system to system by attaching itself to other programs. Worms, a more recent variant on the virus theme, do not need "host" programs. Instead, they spread on their own throughout systems and networks, although they still must be manually executed at least once on each new system they encounter. Trojan horses masquerade as useful programs on the outside, fooling users into running them over and over again.

Whatever they're called, worms, viruses, and Trojan horses can do serious harm to your system. Some virus creators are content to simply flash a cryptic message on your screen, while others slow down your system by eating up processor and memory resources at best and actually deleting data at

worst. Some worms have even been known to create "back doors" to your system that let unknown miscreants access your system and its files whenever they like. The fastest spreading worms, such as Melissa and ILOVEYOU automatically send copies of themselves (sometimes with embarrassing messages) to friends listed in your e-mail address book.

While e-mail provides the premier vehicle for virus propagation, a message left to its own devices will never infect your computer. Simply receiving, opening, or reading an e-mail message will not introduce a virus to your system. Periodic warnings from well-meaning associates and friends to avoid even opening e-mails with particular subject lines have the right idea, but go a bit overboard. Viruses aren't quite that wily yet, so no one should be afraid to at least open an e-mail message to get a better idea of whom it is from or what it says.

Where every user should exercise vigilance, on the other hand, is the shady world of attachments. Attachments are files that e-mail senders sometime clip to their messages for simultaneous delivery. Most e-mail programs display attachments as small icons either at the top or bottom of a message. A paper clip icon somewhere on or inside the message often indicates the presence of an attachment, which provides a cozy environment for virus travel. Again, simply opening an e-mail, even if it carries an attachment, will not let loose a virus. Opening the attachment, however, is another story.

■ **Protect Yourself.** The first and foremost technique for keeping your PC free of viruses is to refuse to open unknown attachments. Even an attachment that represents itself as being sent by a friend could be a worm that raided your correspondent's address book. Therefore, it isn't enough that you recognize the name of the sender. When you see an attachment you didn't expect to receive, consider it with suspicion. Before opening it, write your friend back to see if they meant to send you an attachment. Because most viruses do not act immediately, a modern-day Typhoid Mary may easily spread a virus to dozens or hundreds of associates before anyone notices a problem.

Not all attachments are equally dangerous. A JPEG (Joint Photographic Experts Group) picture file, for example, contains no executable code that could conceal a virus. It is a

## Firewalls

Not content to wait for viruses to propagate through e-mail attachments, some hackers try a more direct method of examining or deleting the data of others. Users with always-on cable or DSL (Digital Subscriber Line) access provide hackers with a potential playground of hard drives connected directly to the Internet and, sadly, often lacking in even rudimentary security.

With the high-speed Internet showing up in more and more average homes, personal firewall programs are becoming a must. Firewalls act something like a two-way mirror, letting you access the Internet as normal but blocking off your machine from invasion by unknown sources. Once the province of network professionals, firewalls have been streamlined and simplified for small-business and home users. We took a look at three of the best examples on the market.

### BlackICE

BlackICE Defender, by Network ICE (<http://www.networkice.com>) takes a somewhat different approach. Rather than focus on the permissions granted to particular applications on a machine, BlackICE blocks activity it deems suspicious unless the user designates particular Internet addresses as safe for sending and

receiving data. While this system may give advanced users more control in some cases, it might be a little more difficult for beginners to figure out.

BlackICE excels at analyzing intrusions and helping you gather as much information as possible about potential hack attacks. Whenever someone attempts to break through BlackICE security, the firewall notes the Internet address of the intruder and other data that helps you to determine the severity of an attack and the origin. Good hackers will be able to block most of this information from being discovered by BlackICE, but not all hackers are really very good. Data aggregated from repeat offenders can be used to help beef up your security or at least learn a little bit about the enemy.

### Norton Personal Firewall

Symantec's Norton Personal Firewall (<http://www.symantec.com>) acts like a virus program in some ways. The software is trained to immediately recognize some of the most common Trojan horse programs that spy on your system. Downloadable updates ensure the firewall always has the latest information. Besides firewall

features to stop hackers from getting into your computer, Norton Personal Firewall also includes a gatekeeper to stop certain important information from flowing out. For instance, users can type in specific data, such as a credit card number, that the firewall will block from leaving your system without your permission.

Like the other two firewalls we mentioned, Norton provides users a choice between low, medium, and high security settings. With low security, the program bothers you less often with warnings and alerts over minor issues. Under the high security choice, some of the

Internet's functionality is shut off, but so are all the doors between your computer and hackers.

### ZoneAlarm

Zone Labs' ZoneAlarm (<http://www.zonealarm.com>) boasts two notable features: a well-deserved reputation as being easy to use and price tag of \$0 for personal use. Once downloaded, the program presents a simple interface with four basic features. An Alerts area graphs and measures Internet activity to let you know when data is moving between your computer and another. The Programs area displays exactly which program on your machine is attempting to access the Internet and lets you

customize just how much access a particular program is granted. The Lock features can turn off Internet access even when you are not away, such as when the screen saver turns on, except for programs you specify. Finally, you can press a big red emergency stop button to cut off both incoming and outgoing traffic if you suspect a program is up to no good.

Business users might consider ZoneAlarm Pro, which costs \$39.95 but builds in additional functionality to the clean ZoneAlarm interface. The Pro version adds password protection to keep others from tampering with your firewall settings and other customized controls. ZoneAlarm Pro also adds an e-mail attachment quarantine feature that keeps you from accidentally opening an attachment that might turn out to hold a virus.

All three of these programs log hacking attempts and let you know the instant someone tries something fishy. Install a firewall and you might be amazed just how often your machine is targeted. Most of the activity picked up by firewalls are simple, automated "port scans" that aren't dangerous in themselves but point hackers in the direction of vulnerable machines. On occasion the program is bound to detect a more determined attack, however, and such incidents will make you glad the firewall stands between you and them. □



## Firewall Comparison

	<b>BlackICE 2.5</b>	<b>Norton Personal Firewall 2001</b>	<b>ZoneAlarm</b>
<b>Price</b>	\$39.95	\$49.95	Free download for personal use; \$39.95 for Pro version
<b>Pros</b>	Attempts to record information about intruders	Combines firewall abilities with privacy protection	Simple to use and configure
<b>Cons</b>	Not as intuitive for beginning users	Interface is mysterious beyond the simplistic slider bars	Fewer customizable settings for advanced users

simple file other programs can display that, by itself, does nothing. Executable files (designated by the .EXE and .COM file extensions), batch files (noted by the .BAT file extension), and Visual Basic scripts, however, are examples of attachments that should send up big red warning flags. These types of executable files contain instructions that could be viruses.

Users should also be wary of "unzipping" unknown files in Zip format. Depending on your compression program, an executable file lurking within a Zip file may be called forth automatically. Another potentially insidious attachment is unfortunately one of the most common. The fastest-growing category of viruses today ride inside Microsoft Office document (DOC) files as macros, which are a kind of executable file that records common keyboard and mouse actions to a single key within word processing, spreadsheet, and other documents.

Because you can never tell the true nature of an attachment from the outside, the only way to really protect yourself without unnecessarily banishing all attachments is to invest in antivirus software. Antivirus packages scan through the files on your machine, looking for particular characteristics of known viruses. Antivirus software makers continuously hunt down new varieties of viruses and add their profiles to virus databases.

A good antivirus program such as Symantec's Norton AntiVirus 2001 (<http://www.symantec.com>) costs about \$40. Along with examining files already on your system, Norton AntiVirus 2001 and most of its competitors will also scan incoming e-mail attachments and locate viruses before they have been let out of the bag. If the price of full-featured packages is too steep for you, Computer Associates gives away copies of its InoculateIT Personal Edition free for personal use at its Web site (<http://antivirus.cai.com>). InoculateIT PE doesn't pack a lot of fancy extras, but it does a decent job of locating and eliminating viruses either on command or automatically in the background.

**■ Keep An Eye Open.** While you can rely on reputable virus checkers to clean up most messes, new viruses appear every day and it's not impossible to end up being one of the lucky first victims of a virus for which there is, as yet, no cure. That means it's still prudent to avoid opening suspicious attachments from unknown sources. If an attachment appears out of nowhere, be wary even if you've loaded a virus program.

A few e-mail programs can be set up to automatically open attachments as they come in. If you've noticed this type of behavior before when you receive attachments, look through the options of your e-mail program and make sure the only

way an attachment opens is if you want it to open. If you're an AOL subscriber and use Automatic AOL to download e-mail, you might want to set the program to leave attachments on the server until you know who sent the message. To do this, click Set Up Automatic AOL under the Mail Center menu and click No in the Download Files box. The messages themselves will be fetched but attachments will be left behind until you ask for them.

If your computer is sometimes at the mercy of your kids, a few special precautions are necessary. Most e-mail programs can be set up to require a password for access. Depending on the program you use, it might also be possible to set up automatic message rules that prevent attachments from downloading. Check your program's Help file.

AOL users with children may want to take a look at e-mail controls that let parents keep

kids from downloading attachments when parents aren't around. In the Mail Center menu, choose Mail Controls and then click Parental Controls. Next, click Set Parental Controls and then E-mail Control. Mark the checkbox toward the bottom of the dialog box to block attachments. You can customize these controls for different screen names, so you could set up the system to let your own ID send and receive attachments as normal.

**■ Keep E-mail Private.** While viruses represent the best-known e-mail boogeyman, is a growing concern. The electronic wizardry of e-mail conveys a false sense of security to its users. Because most of us have neither clue nor desire to read others' e-mail messages, we figure that no one could or would read our e-mail. Unfortunately, e-mail is not as secure as it might seem.

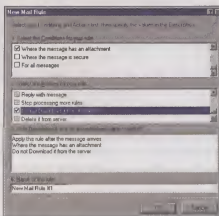
The analogy most often used to describe e-mail is the postcard. Just as postcards reveal your message to postal employees or the just plain snoopy, the average e-mail is open to the prying eyes of network administrators and others with the time and knowledge to tap into your electronic communications.

On the other hand, just because it is possible for someone to read your e-mail, does that mean it is likely? Probably not, and no one should be terribly concerned about run-of-the-mill electronic correspondence. However, the inherent insecurity of your e-mail should make you think twice about certain uses.

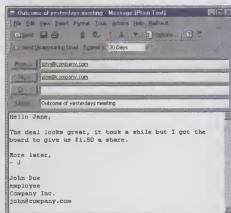
For example, some online merchants may ask for your credit card number via e-mail. One common trick in such circumstances is to separate the credit card information between two different e-mails. While hackers might intercept one of your messages, they probably will not be able to snag the second.

The best way to stop snoops from reading files on your computer or inter-

cepting e-mail messages en route is to encrypt your messages. (See "Protect Your Privacy" on page 137 for more on encryption.) However, realize that even if you do



Using Message Rules in a program such as Outlook Express, you can select whether you want e-mail with attachments to download at all.



E-mail tools from Disappearing Inc. let you control how long a message remains readable after you have sent it.



what you can to keep private information private, the recipient of your message could compromise everything. A message is worthless unless your recipient can read it, and if they can read it, they can leave it unattended or unencrypted.

A company called Disappearing Inc. (<http://www.disappearing.com>) offers an intriguing add-in for Microsoft Outlook that lets users send messages that become unreadable after a set time period. Whenever recipients Reply or Forward such messages, the new message is also written in Disappearing Email format. Sending someone a message through the Disappearing system goes a long way in impressing the importance of privacy upon recipients to your message, but the tactic isn't foolproof. For example, nothing stops your intended recipient from printing out e-mail messages or copying and pasting information to another program.

It can even be possible for nosy superiors to capture messages before you have had a chance to encrypt them. Certain spy programs monitor individual keystrokes, letting employ-

ers or network administrators reconstruct every single word pecked out by your fingers. What's more, this type of snooping is completely legal so long as it is limited to employer owned machines and the information stored therein.

What's the solution? Unless you run your company's computers yourself, treat them as open to the curious. At home, make use of encryption and periodic hard drive clean-ups, but keep in mind the weak link at the other end of every e-mail message you send.

#### ■ Watch Your Back.

Web-based e-mail systems, such as Yahoo! Mail or Hotmail, present additional security concerns whenever you check your inbox from a computer accessible by others. User IDs and passwords protect the mailboxes from being called up by just anyone, but problems can arise if you forget to log out of a public computer or carelessly leave your password lying about. For example, if you sign on to your account and then leave the computer for a couple of minutes, someone else could not only read your messages,

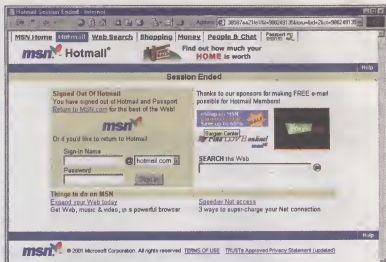
but they could also send messages masquerading as you.

The powers behind Web mail services attempt to cut down on unpleasant mistakes. For example, Yahoo! Mail makes it impossible to set a browser bookmark for the actual mailbox. Additionally, the interface automatically clears sensitive information from the browser's cache when you sign out. If you log out and leave the computer, someone else cannot gain access to your mailbox simply by clicking the Back button.

Another point to keep in mind on any e-mail system is to keep your password secret. Yahoo!, Hotmail, AOL, or your own Internet service provider should never ask you for your password on the phone or online, so you ought treat with caution anyone who contacts you out of the blue and purports to be from one of these entities. General password rules apply, as well: Don't choose an obvious password, such as the name of your spouse or something written on a sticky note attached to your monitor. In fact, don't use a real word at all. Mix it up with numbers and other characters. It may be harder for you to remember, but it is much more difficult for someone else to crack.

Such basic precautions should help you avoid most any e-mail threat from whatever direction it approaches. Though some users out on the Internet may indeed turn their e-mail power to evil, a little knowledge is the best tool for protecting yourself. **ES**

by Alan Phelps



To help deter other users from accessing your account, make sure that you remember to log out after using a Web-based e-mail service.

## 10 Things To Protect Your E-mail

- 1 Never open an e-mail attachment from someone you do not know.
- 2 Think twice about opening executable attachments even from people you do know.
- 3 Set up your e-mail program so that it does not automatically open attachments.
- 4 If you have children, consider using message rules to leave attachments on the server rather than download them to your drive.
- 5 Load and use a good antivirus program.
- 6 Use an encryption scheme such as PGP (Pretty Good Privacy) to keep sensitive e-mail safe from prying eyes while en route.
- 7 Your computer at work is not private. Even if you use encryption, a determined employer can record your keystrokes with the right program.
- 8 Remember that even encrypted e-mail can be distributed, intentionally or accidentally, by the recipient.
- 9 If you use Web-based e-mail on a public computer, remember to log off of your account when you're finished.
- 10 If others have access to your machine, consider using the password feature of your e-mail program to stop snoops.

# Protect Your Privacy

## Use Encryption To Ensure E-mail Integrity



If a false sense of security regarding e-mail communications has lulled you to sleep, we're here to tell you that privacy and anonymity exist only as relics from a pre-Internet world. There is literally no way for you to prevent people from intercepting your e-mail. Each and every message that leaves your Outbox sifts its way through dozens of servers, routers, and relays before reaching the recipient's Inbox. At any point along the way, a qualified (or snoopy) person can access your message. Encryption of e-mail messages helps to ensure your privacy. If you're not already using some method of encoding your online communications, it's high time you considered your options.

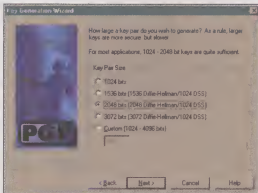
**■ Encryption 101.** In a nutshell, encryption is the process of translating an original message (plaintext) into an unreadable form (ciphertext) by using a mathematical formula or algorithm called a cipher. The process also works in reverse (known as decryption) to return the ciphertext message to plaintext.

The process of encryption and then decryption requires you obtaining and then

using two keys—a public key and private key. Keys come in a wide range of sizes from 128 bits to 3,096 bits in length. The longer the key the more secure it is. Likewise, the more complex the mathematical algorithm used for the encryption, the harder it is to crack. However, the trade-off for super security is loss of speed.

Algorithms come in two different varieties: symmetric and asymmetric. If you use a symmetric algorithm for encryption, you use the same public key to

encrypt and decrypt an e-mail message. This means that you must copy your key and give it to any recipients with whom you want to exchange secure e-mail. If they don't have your key, they won't be able to read your messages. Naturally, a fair amount of trust is required. Asymmetric algorithms use both the public key and the private key. Other people can send you messages secured with your public key, but you are the only person who can open the messages using your own private key.



**The size of your PGP (Pretty Good Privacy) keys is also up to you. For most applications, the range of 1,024 bits to 2,048 bits is adequate.**

Generally, your private key, public key, and all your friends' public keys are saved on your computer, so sending and receiving encrypted messages requires no more than a few extra clicks. The beauty is that only recipients with proper keys and passwords can decode your messages. Otherwise, encrypted messages look like either a blank page or scrambled nonsense.

Besides encryption, you should also understand the concept of digital certificates and signatures. Digital certificates (sometimes known as digital IDs) are issued for the purpose of absolutely proving or disproving your electronic identity. Each message sent with your digital certificate contains a serial number, your name, and your public key information. Digital signatures, not quite as advanced as certificates, merely verify the sender of a message and ensure that the message was not in any way tampered with or altered since origination. Much like your written signature, your digital signature is your official identification.

Of course, the first step toward encrypting, signing, or certifying is obtaining a set of keys. You can generate your own key sets with the help of various encryption software programs, or you can have them generated for you by a CA (Certificate Authority).

**■ Encryption in All Flavors.** The two main standards for encryption are PGP and S/MIME. In e-mail programs that use either the PGP or S/MIME standards, you can choose to encrypt, sign, or do both (or neither).

**MIME (Multipurpose Internet Mail Extensions)** is a protocol that enhances e-mail, letting various e-mail programs communicate with each other in spite of differing character sets and multimedia attachments. **S/MIME (Secure MIME)** is an additional set of standards that builds on the MIME standard by encrypting or adding digital signatures to MIME-formatted messages. Many common e-mail programs use S/MIME.

Developed in 1991 by Philip R. Zimmermann, PGP (which literally stands for Pretty Good Privacy) is a popular program used to encrypt and digitally sign e-mail messages. However, not only is PGP an encryption software program; its form of encryption has become a de facto standard for e-mail security.

Encryption standards are based on various different mathematical algorithms. The following are a few of the symmetric algorithms you're likely to encounter.

Blowfish is one of the fastest algorithms available, and it uses a variable-length key, from 32 bits to 448 bits. Created in 1993, this code is yet unbroken.

DES (Data Encryption Standard) is still fairly fast and fairly secure, applying a 56-bit key to each 64-bit block of data. It was created in the 1970s by IBM and was adopted by

the U.S. Department of Defense. While its code has since been cracked, it is still considered a safe method of encryption, as breaking a DES code takes a considerable amount of time.

IDEA (International Data Encryption Algorithm) uses a 128-bit key and has not yet been cracked. Ascorm-Tech holds the patent for

this algorithm, but non-commercial users can use it free of charge.

The TEA (Tiny Encryption Algorithm) is moderately safe and nearly as fast as Blowfish. You might not want to use it for highly sensitive data, though, as the keys themselves are not as strong as the algorithm.

3DES (Triple DES), created by W. Diffie and M.E. Hellman, applies the DES algorithm to the data three separate times with three separate keys. 3DES is probably the most secure encryption method, though its extreme slowness makes other methods more appealing for everyday data encryption.

Quite often, asymmetric algorithms take formulae from other algorithms and then combine them to create a public key/private key tool. PGP and RSA are two such asymmetric algorithms.

The PGP standard uses an asymmetric algorithm derived from the combination of existing algorithms, including RSA, IDEA, and 3DES.

RSA (Rivest, Shamir, and Adelman), developed in 1977, is based on factoring and multiplying large prime numbers. Due to the high complexity, this code has not yet been cracked. It is extremely secure, albeit very slow.

## How To Use PGP

**B**egin by going to <http://web.mit.edu/network/pgp.html>, the site from which to download a free version of PGP for non-commercial use. Scroll down the page and then select to download PGP Freeware version 6.5.8 for Windows 95/98/NT/2000. After answering a few questions, you may begin the download process. Save the file to a diskette and select an easy-to-remember place for it on your hard drive. The download of PGPF658Win32.zip may take a couple of hours over a 56Kbps (kilobits per second) modem and dial-up connection.

When finished, unzip the file and look for Setup.exe. Select Setup.exe to install PGP on your computer. At the Welcome To The PGP Setup Program window, click Next, accept the software license agreement, read the What's New screen, and then enter your name under User Information.

At the next screen, select a folder for PGP (the default is usually OK). When you are asked to pick your installed components, be sure to uncheck PGPnet Virtual Private Networking. Select PGP Qualcomm Eudora Plugin, PGP Microsoft Exchange/Outlook, or PGP Microsoft Outlook Express,

depending upon which (if any) of the above e-mail clients you use.

PGP then informs you that it is ready to begin copying files. The program installs to your hard drive and asks if you have any existing keyrings you wish to use. Click No. At the next screen, PGP has finished installation and asks if you want to launch PGPkeys. Select this option and click Finish.

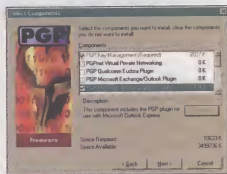
Click Next at the Key Generation Wizard and then enter your name and e-mail address. When Setup asks you what type of key to generate, we recommend that you choose the newer style, Diffie-Hellman/DSS. As for key size, remember that larger keys enable higher security but result in slower performance. For most users, 1,024 bits to 2,048 bits is satisfactory. Finally, specify that your key pair never expire, or assign an expiration date of your choice.

Your passphrase is a password you must enter to use your private key. After selecting a passphrase, PGP generates your new key pair. You are then prompted to send your public key to the PGP server, making it publicly available to those who wish to send you encrypted messages. If you are currently connected to the Internet, simply select

Send My Key To The Root Server Now.

PGP works as a plug-in with many versions Microsoft Outlook, Microsoft Outlook Express, QUALCOMM Eudora, Claris Emailer, and Netscape Messenger to name a few. The next time you open your e-mail program, expect evidence of PGP in the form of buttons or menu items. For instance, Outlook Express inserts a PGP entry into the Tools menu. From there, you can open the PGP Options dialog box or launch PGPkeys to look up other people's public keys. When you begin a new message, the New Message window toolbar contains buttons for encrypting, signing, and opening the PGPkeys directory. Signing requires your passphrase, and encrypting opens the list of public keys.

Even if you don't use an e-mail program that PGP automatically works with, you can still use PGP encryption. In Hotmail, for example, compose your message as usual and then click the PGP icon in the system tray on the Windows taskbar. From the pop-up menu, choose Current Window, and then select whether you want to Encrypt, Sign, Encrypt and Sign, or Decrypt and Verify. □



**You need to tell PGP (Pretty Good Privacy) which components to install. If you use one of the e-mail clients supported by PGP, be sure to check the appropriate plug-in for installation.**

■ **Consider The Options.** You may not know it, but the very e-mail program you are using may already include some form of encryption.

Microsoft Outlook and Outlook Express. MS-Outlook 2000 and Outlook Express 5.x have built-in encryption tools that let you digitally sign and encrypt your messages. They use the S/MIME mail encryption standard.

The first step is getting your public and private keys from VeriSign. To do so in either program, open the Tools menu, choose Options, and then select the Security tab. Click the Get A Digital ID button to go (indirectly) to

VeriSign's Web site. After completing the registration process online and downloading the appropriate files, you should have your private key stored safely on your hard drive. Once again, open the Tools menu, choose Options, and then the Security tab. This time, Outlook users should click Import/Export Digital ID button, and Outlook Express users should click the Digital Ids button and then choose Import. This process makes your freshly downloaded key accessible to your e-mail software.

## How Encryption Works

If you want to make your e-mail experience a little more private, then consider sending encrypted messages. Encryption requires a public key and a private key.

The sender encrypts the message using the recipient's public key, which is stored on his computer. When the recipient gets the message, he decrypts it, using his own

private key. If he chooses to reply to the sender, the recipient writes his message and then encrypts it with his copy of the sender's public key.

To encrypt a message, create your e-mail message as usual. In the Message window of Outlook, open the View menu, select Options, and then choose either Encrypt Message Contents And Attachments or Add Digital Signature To Outgoing Message. In Outlook Express, pull down the Tools menu in the New Message window, and then select the option to either Encrypt or Digitally Sign the message.

**Netscape Messenger.** Messenger uses S/MIME and 128-bit encryption to send

encrypted messages and authenticate the originator of received messages. Within Messenger, recipients can see who signed the message and view the certificate for additional detail.

Open a new message window and prepare your message. Select Options from the View menu and then use check marks to choose either encryption or signing for the message. If you have Communicator 4.5x or 4.7x, click the Security icon (the padlock) on the Message toolbar, and the resulting screen tells you whether the recipient has a security certificate and how to include your own certificate.

To use the digital signature option, you will need to get a certificate. Click the Security button on the toolbar. In the Security Info window, locate the Certificates heading; select the Yours option listed under that heading. Choose the Get A Certificate button, then follow the on-screen directions to complete the process.

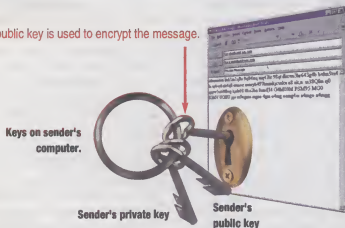
**HushMail.** Most Web-based e-mail programs don't offer much in the way of encryption. However, HushMail (<http://www.hushmail.com>) claims to be the first encrypted Web-based e-mail, using the Blowfish algorithm to encrypt and decrypt messages. The service is free, and it supports most of the major e-mail clients currently in use. Thus, your recipients should have no trouble reading messages encrypted in HushMail.

If you choose not to use the encryption options already available within your e-mail program or if your e-mail program offers no encryption, you may want to consider one of the many third party applications on the market.

We've already mentioned PGP from Network Associates (<http://www.pgp.com>), and the accompanying sidebar details the process of downloading and using this popular security solution. Yet, by no means is PGP the only available option. Encryption Plus Email from PC Guardian (<http://www.pcguardian.com>), DataSAFE SE from NovaStor (<http://www.novastor.com>), Ion1 Lite from Ion1 Mail (<http://www.ion1mail.com>), and InvisiMail Lite from InvisiMail (<http://www.invisimail.com>) are just a few of today's easy-to-use encryption programs.

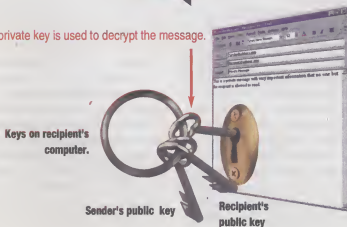
Encrypting your e-mail needn't be a chore, especially if your e-mail program already offers easily configurable security options. No matter what form of encryption you choose to use, you will certainly thank yourself for the extra level of protection and privacy. **ES**

Recipient's public key is used to encrypt the message.



Message sent

Recipient's private key is used to decrypt the message.

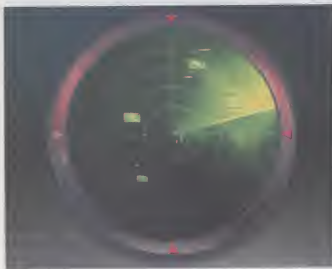


by Hannah Henry



# Trace Your E-mail

## Find The Source Of Unwanted Messages



If you're a home PC user with an e-mail account, you're probably familiar with unsolicited e-mail, a.k.a. spam. Most of us take the JHD, or Just Hit Delete, approach to those unwanted adult e-mail messages and get-rich-quick schemes for several reasons. Because we fear viruses, we know that most spammers use fake sender addresses, and we've learned the hard way that replying to unsolicited e-mail is the worst thing you can do (for more information about spam, see the related article on our Web site (<http://www.smartcomputing.com/guide/0907/spam.htm>)).

But there comes a time in every computer user's life when you just have to say "I'm mad as heck, and I'm not going to take it anymore." Maybe it's the 9 millionth spam from oofq-peg@msn.com that pushes you over the edge. Or maybe it's some jokerster masquerading as someone you know and sending you or someone you love inappropriate or threatening e-mail messages. Whatever it is that inspires you, take action. You *can* do something about unwanted messages other than just pressing the Delete key. You can trace the offending e-mail back to its point of origin.

If the idea of tracing an e-mail address makes you feel a bit like the Lone Gunmen from the television show "X-Files", you're in good company. For more than 10 years, the FBI has been working with telecommunications carriers and ISPs (Internet service providers) to

collect network-addressing and transactional information about suspected criminals.

### ■ How It Works.

According to the FBI, crimes such as terrorism, hacking, espionage, and child pornography are increasingly perpetrated via, or with the assistance of, the Internet. As a result, the FBI recently built a tool called Carnivore (since renamed the more innocuous-sounding DCS1000) that is specially designed to collect electronic data from ISPs.

The Carnivore tool is much like the commercially available diagnostic tools that ISPs use to monitor their networks, except it contains sophisticated filtering capabilities which enable it to distinguish between the data the FBI is permitted by court order to intercept, and the non-suspect data being exchanged across the network and Internet. When the FBI launches a surveillance mission, the agency and the ISP in question agree upon an access point on the network, and the FBI then inserts Carnivore and begins filtering and collecting the appropriate data.

Not surprisingly, Carnivore has generated a great deal of controversy, and groups such as the American Civil Liberties Union and the Center for Democracy and Technology, as well as some members of congress, have raised concerns that the tool is an invasion of online privacy. The FBI says Carnivore is both necessary to national security and respectful of the privacy of individuals not under suspicion. In any case, the Carnivore tool has been used to track down criminals in approximately 25 cases over the past two years. None of the cases have gone to trial yet, so the FBI is mum on the details.

Once a suspect is identified, the FBI uses sophisticated tools such as Carnivore to intercept the suspect's e-mail messages. But when it comes to the initial trace that tells the FBI who

the suspect is and what ISP they are using, the method is the same for the law and the layperson: deciphering the e-mail message's header information.

As we mentioned above, it's almost ridiculously easy to fake a return e-mail address. For most e-mail programs, it's simply a matter of creating a new identity or profile. Professional spammers have developed more sophisticated methods of forgery, such as faking sending and receiving information, but e-mail messages are purely data. And as those messages pass from the sender's machine to the sender's ISP's mail server to your ISP's mail server to your inbox, they accumulate a trail of information that, when deciphered, lets you trace the e-mail back to its source.

The first step in tracing an e-mail is to uncover the full header information. Most e-mail programs simply give you the (alleged) sender name or address, the recipient name, and the subject line. The technical data that tells the network how to route the mail from sender to receiver is hidden. In order to reveal the full header, you'll need to consult your e-mail program's help file or visit SpamCop's FAQ page (<http://spamcop.net/help.shtml>), which includes specific guidelines for showing headers in most commercially available e-mail programs. For the sake of example, we'll walk you through how we traced an e-mail message we received entitled "Snow White and the Seven Dwarfs—The REAL Story!" that was purportedly sent by hahaha@sexyfun.net.

To make sure this was not a legitimate e-mail from someone we knew, we pointed our browser to Whois.net (<http://www.whois.net>) to see who owns the domain sexyfun.net. You can choose to search by domain name or keyword, or select the Whois Domain Name Lookup beneath Other Tools And Information. When we plugged the domain name in, Whois brought up a list of information about the domain name we specified. In the address field we found, For Virus/Spam Help or Questions Go To WWW.SEXYFUN.NET.

A visit to that URL (uniform resource locator; Web address) confirmed our suspicions. The e-mail was unsolicited and dangerous. A warning message was posted, telling us not to open any e-mail messages from hahaha@sexyfun.net as they are infected and have a fake return address.

The next step was to read the message header attached to the Snow White e-mail. In this example, we were using Microsoft Outlook Express 5. In order to reveal the header information of the offending e-mail, we opened the message,

clicked the File menu and chose Properties. We clicked the Details tab and selected Message Source. This opened up a new window that contained the following information (numbers and addresses have been altered to protect our Inbox from more unwanted messages, but it will give you an idea of what you should be looking for.)

#### Fake E-mail Header:

```
Received: from mtaX.snfXX.abc.net (mtaX-
pr.snfXX.abc.net)
  by simsX.snfXX.abc.net
  (Sun Internet Mail Server
  sims.3.5.2000.03.23.18.03.p10)
  with ESMTP id
  <0GB000J4ZQ8H1L@simsX.snfXX.abc.net> for
  yourstruly@sims-ms-daemon; Fri, 30 Mar
  2001 08:09:53 -0800 (PST)
```

```
Received: from CSFAX ([207.158.169.69]) by
mtaX.snfXX.abc.net (Sun Internet Mail Server
sims.3.5.2000.01.05.12.18.p9)
  with SMTP id <0GB000577Q7Z1I@
mtaX.snfXX.abc.net> for
  yourstruly@simsX.snfXX.abc.net;
Fri, 30 Mar 2001 08:09:52 -0800 (PST)
  Date: Fri, 30 Mar 2001 08:09:52 -
0800 (PST)
```

```
Date-warning: Date header was
inserted by mtaX.snfXX.abc.net
From: Hahaha
<hahaba@sexyfun.net>
Subject: Snowwhite and the Seven
Dwarfs - The REAL story!
```

```
To: yourstruly@myISP.net
Message-id:
<0GB000578Q081I@mtaX.snfXX
abc.net>
```

```
MIME-version: 1.0
Content-type: multipart/mixed; bound-
ary="—
VEVHQF45Y30HUZWY1YB4DYBG1QVS1A4
TQF"
```

E-mail headers may look slightly different depending on the kind of equipment your ISP uses, but the basic identifying tags will generally follow the same format.

As mentioned above, the obvious identifying tags, such as the From: field, can be faked. The real information, however, can be found in the Received lines, which record the e-mail message's path from mail server to mail server. To interpret these, you must work backwards from bottom to top, starting at the first machine that received the message from the sender. In this case, we started with the line that read:

```
Received: from CSFAX ([207.158.169.69])
```

```
by mtaX.snfXX.abc.net (Sun Internet Mail
Server sims.3.5.2000.01.05.12.18.p9)
  with SMTP id <0GB000577Q7Z1I@
mtaX.snfXX.abc.net> for
  yourstruly@simsX.snfXX.abc.net; Fri, 30
  Mar 2001 08:09:52 -0800 (PST).
```

Translated into English, this line means the e-mail message was received from CSFAX ([207.158.169.69]) by our ISP (abc.net) for our e-mail address (yourstruly@simsX.snfXX.abc.net).

In all likelihood, the sender name, CSFAX, is faked. But the string of numbers in brackets represents the sender's IP (Internet Protocol) address, and IP addresses must be verified by the sender's mail server and therefore can't be forged. (Some spammers try to throw you off here by adding a fake IP address that would look something like this: CSFAX (198.157.136.81) [207.158.169.69]). The address

Snow White message, into the address digger tool; selected all the tracing options; and clicked the Do Stuff button. The first result we received was the Official name, which was annex-0-9-port-5.dialup.coast.net

The address digger performed a Whois check on the official owner of the IP address we inserted and returned various information including a mailing address for the registrant, as well as administrative and technical contacts and their mailing addresses and contact phone numbers.

Unfortunately, without a tool like Carnivore, this is as close as you can get to finding the real sender of the offending e-mail. However, the ISP can usually find the perpetrator and will cancel his account, so it's worth it to complain to the offender's ISP.

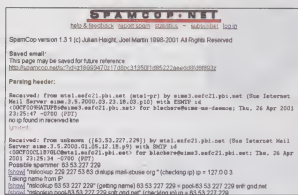
If you are going to contact the offender's ISP, don't just send off a volley of angry e-mails to the administrative contact. Most ISPs have an address specifically for e-mail abuse complaints, or you can refer to SpamCop's Web site where you can request a message be traced. If the address is found, SpamCop will send a complaint on your behalf to the provided address.

Using SpamCop's free Spam report engine is as simple as learning how to view full headers in your e-mail program. To sign up, you provide the service with your e-mail address, to which the service mails a URL. Bookmark the URL and then, when you get a piece of unwanted mail, visit the URL, paste the full header and body of the e-mail into the designated area, and click Process Spam. Within a few seconds, SpamCop will track the message source, rate the IP address and ISP for Spam abuses (which depends on how many reports have been filed against them—ooqfpeq@msn.com, for example, had a complaint rating of 25), find at least one e-mail to report the abuse to, and send an automatic report to any addresses it finds.

In the case of our Snow White e-mail, the SpamCop results gave us the same information as we received from SamSpade.org, only it went one step further and sent a complaint for us.

■ **Taking Care Of Business.** As annoying as unwanted e-mail can be, you gotta love how the Internet takes care of itself with sites like SamSpade.org and SpamCop. As for us, now that we have a tool to do the complaining for us, we'll never just Hit Delete again. [E]

by Kristina Blachere



Here is an example of how SpamCop parses an e-mail header to determine its origin.

in parentheses is probably fake, but the one in brackets has been generated by the mail server and is real.)

To trace an IP address, you can use a tool called a Traceroute, which is available on the Internet from institutions such as MIT and Princeton. Keep in mind, though, these Traceroutes tend to be designed for network administrators and therefore generate results that are incomprehensible to most average users. For a more user-friendly alternative, download the TRACE.BAT tool from PCHelp (<http://www.pchelp.org/trace.htm#use>), or visit SamSpade.org (<http://www.samspade.org/t>) and use its suite of tracing tools, as these programs perform all the network tracing tests available and deliver answers in a simpler package.

We went to SamSpade.org and pasted the IP address [207.158.169.69], which belongs to the

# The Spam Invasion

## Save Yourself!



**Y**ou know the scenario: You're enjoying a meal, perhaps a meal that includes a processed, canned meat product, when the telephone rings. Suddenly a stranger bombards you with plans for new credit cards, improved long-distance service, or other too-good-to-be-true offers. These invasions of your personal space are annoying by themselves, but what makes them even worse is that they are almost never financially advantageous to you, the consumer. (There's a reason these companies are willing to pay a telemarketer to sit and make telephone calls.)

Worse still is that while telemarketing is bad enough, it's beginning to take runner-up status on the scale of annoyances. UCE (unsolicited commercial e-mail), or spam, may be evolving as the king of annoying personal advertising. We'll discuss some of the basics of spam and help you figure out how to prevent it from ruining an otherwise tranquil evening.

■ **Spam's Basics.** Spam takes many forms, ranging from simple product introductions to illegal scams. The broadest definition of spam is any e-mail you don't request to receive. However, if you receive a message from a long-lost friend who stumbled upon your address, you wouldn't likely consider that spam. A more concise definition would be that spam is junk e-mail; messages that aren't part of a correspondence. E-mail from companies,

chain letters, e-mail hoaxes, get-rich-quick schemes, and pornographic material can all be considered spam. Not only is spam annoying for the recipient, but it also ties up valuable Internet bandwidth, slowing the overall network for the Internet community as a whole.

Almost anyone with a computer and an e-mail software program can generate spam. Spammers (people who send spam) often purchase lists of active e-mail addresses in an effort to find potential customers. Some spammers also use a sophisticated process to hide their original e-mail addresses, which, of course, frustrates angry recipients trying to track them down.

Spamming survives because a spammer can send thousands of e-mails in a few seconds for a few cents. Having a telemarketer make an equivalent number of calls or sending an equivalent number of junk mail letters through the postal mail would cost hundreds or thousands of dollars. Spammers know 99.9% of recipients hate the junk e-mail and trash it immediately, but the occasional response easily makes the process financially worthwhile.

■ **Protect Yourself.** Spammers won't typically be able to find you without at least a little of your help. If you closely guard the privacy of your primary e-mail account, chances are good you won't find spam littering your inbox. Here are some tips for protecting your primary e-mail address.

Read the rules. While many Web sites require an e-mail address before they will process your registration, each site makes various promises about how it will handle your e-mail address. Read all of the Web site's rules and promises regarding how it will use your e-mail address. Most Web sites will let you determine whether you'll receive commercial e-mail from the site, usually by checking or unchecking a checkbox. Once you've read the site's rules

regarding e-mail usage, you can then decide whether you want to give the site your primary e-mail address or a secondary address (which we'll discuss next).

Use a secondary address. If you're fearful about sharing your primary e-mail address with a Web site because of potential spamming problems, just give the site a secondary e-mail address. Dozens of Web sites will give you a free, Web-based e-mail account that you can use as a secondary address. Share this secondary e-mail address with sites you think might send you unwanted e-mail; this way the spam won't clutter your primary e-mail inbox. You can check the secondary address once a week to make sure you aren't missing any legitimate messages.

Guard your identity. You probably already know that sharing personal information in chat rooms, on a Web page, or in newsgroup postings is a bad idea. However, you may not know that it's also a bad idea to post your primary e-mail address in such areas. A spammer looking to collect addresses will often look in these areas first. The spammer then might sell the lists to or trade them with other spammers, multiplying your problems. After your primary e-mail address hits one of these lists, it's almost impossible to stop the spam.

Perhaps the best advice to follow with your primary e-mail address is to only give it to others, including friends, co-workers, or clients, who you are 99.9% sure won't share it or forward it in chain letters. For any commercial purposes or for public postings, use a secondary address.

■ **Track Down A Spammer.** While spammers might seem impossible to stop, you do have a few options in battling them, if you don't mind spending some time on the process.

Rat them out. Very few ISPs (Internet service providers) would knowingly allow spammers to use their servers. If you can track down the server where the spam originated (this requires some detective work), notify the ISP about the spamming. It almost certainly will put an immediate stop to it.

Trick them. Let's say you suspect a Web site of selling your e-mail address to a spam list. Of course, the site won't admit any wrongdoing. You can catch them, though, with some detective work.

First, create a free e-mail account at a Web site such as Yahoo!. Then share that e-mail address with only the Web site in question

and no one else. For example, say you suspect the fictitious WidgetsRUs.com is spamming you. Just create an e-mail account, such as [catching\\_widgets@yahoo.com](mailto:catching_widgets@yahoo.com), and provide that address to WidgetsRUs.com as your primary e-mail address but share it with no one else. Check this e-mail account occasionally over the next month to see whether any spam has arrived. If you find spam, you know the site is the cause of it. (Keep in mind some sites will send you periodic commercial e-mail about the site itself or from third-party sites, unless you opt out of receiving these messages during the registration process.)

Once you catch a site that's using your e-mail address to generate spam, make a

formal request to have your address protected by the site. If the site doesn't comply, check your state's laws to determine any course of action you should take to report the spammer.

■ **The Backlash.** As we mentioned, users can turn to their ISPs for help in the fight against spam, and many users have done just that. Unfortunately, some ISPs are having problems because they're blocking too many messages. Some users have complained that their ISPs are blocking e-mail messages without notification; other users say ISPs have labeled them as spammers for minor, inadvertent, or phantom violations. Such prob-

lems are rare, though, and spam-blocking efforts seem to be helping slow the flow of spam. You can add to your ISP's efforts with some of the tips in the "How To Can Spam" sidebar.

Unfortunately, much like telemarketing calls and junk postal mail, spam isn't going to disappear. The best advice for dealing with spam is to battle it when given the opportunity. At least with spam, it won't interrupt your dinner . . . as long as you aren't eating in front of your computer. [E]

by Kyle Schurman

## How To Can Spam

**T**ired of receiving spam? Try these tips to purge your inbox for good.

**Software options.** Several types of software tout their abilities to block spam. Two of the best are SpamKiller (<http://www.spamkiller.com>) from Novasoft and Spam Buster (<http://www.contactplus.com/spam/spam.htm>) from Contact Plus. SpamKiller, which costs \$29.95, is able to monitor any of several e-mail accounts, and it marks spam with a special icon. Spam Buster also marks spam with a special icon. Spam Buster offers a free version that contains pop-up advertisements; an ad-free version costs \$19.95.

**Filters.** You can set Microsoft Outlook to mark spam or move it to a new folder as soon as you receive it. To do so, choose Organize from the Tools menu. Click the Junk E-Mail link and set particular colors for spam. Now you'll be able to quickly identify those messages in your Inbox and delete them.

If you'd rather automatically move the spam into a Junk E-Mail folder, choose Move from the first drop-down list and choose Junk E-mail from the second drop-down list. Click the

Turn On button. Outlook will ask you what you want to name the folder in which it should automatically put the junk e-mail it detects. Name the folder and click OK.

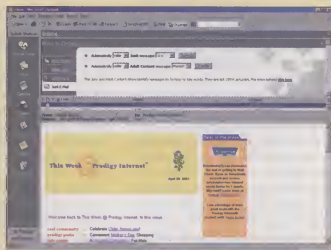
Other e-mail programs have similar filters. While these methods are handy, keep in mind they aren't perfect; they probably won't block every piece of spam you receive.

**Don't reply.** Whatever you do, don't reply to spam. All replying does is verify that your e-mail account is active, which will result in additional spam. Many spammers provide directions for unsubscribing to the e-mail, but these directions are usually ruses to trick you into responding to the e-mail, which, in turn, generates more spam. If you've legitimately subscribed to an e-mail newsletter and you want to unsubscribe, check with the publisher's Web site for instructions instead.

**The bigger picture.** Beyond trying to protect your personal e-mail address, you also could let your federal and state representatives know you support federal and state laws designed to stop spamming.

According to the Spam Laws Web site (<http://www.spamlaws.com>), congressmen have introduced a few bills in the current U.S. Congress designed to punish spammers. Although at the time of this writing, the federal government hasn't passed any laws concerning spam, several

author of the Spam Laws Web site. "In a couple of states, these laws have been challenged on constitutional grounds, since e-mail involves interstate commerce, but the ability of states to regulate spam hasn't really been settled yet."



In Microsoft Outlook, you can use filters to sort or mark potential spam.

states have passed antispying laws.

"Some of these (state) statutes give individual recipients the right to sue for violations," says David Sorkin, professor at The John Marshall Law School in Chicago and

You also can visit other Web sites devoted to battling spam, including CAUCE (<http://www.cauce.org>) or SpamCop (<http://spamcop.net>). □



# E-mail & Your Legal Rights

## Watch Your E-mail Messages . . . Your Boss Probably Does



**A**mericans are quick to point out the virtues of a democracy, with all of the freedoms it offers. However, they're almost as quick to give up many of those freedoms in exchange for an employer's paycheck. Once you agree to take a job, you give up many of your basic freedoms, especially your freedom of speech, at least where your job is concerned.

If you're representing your employer, either through the normal course of your job or by using the employer's equipment, you must watch your written and verbal comments to avoid repercussions. The use of e-mail in regard to freedom of speech has become especially bothersome for employees and employers for several reasons. We'll discuss some of the limitations employers typically place on what their employees can say or do in regard to using e-mail.

■ **Few E-mail Rights.** Attorneys and legal experts we spoke with say employees have almost no freedom of speech rights when it comes to using e-mail in the workplace. The judicial system has tried several cases where employers have fired employees for misusing the employers' e-mail systems; the employees in these cases usually fare poorly.

Most cases no longer reach the judicial system because of previous precedents. In a

recently publicized case, the New York Times Co. fired 23 employees, allegedly for sending unsolicited e-mail messages containing sexually offensive jokes and photos. Even employees who didn't participate in the sending of the messages, but who deleted the messages they received without informing management, were reprimanded. "The employer basically has total control," says Timothy Walton, an attorney with FindLaw.com.

**Why do they do it?** Most employers who monitor e-mail usage and other forms of employee communication say such monitoring is important for heading off potential problems. (See the "Why Do Employers Read E-mail?" sidebar). In addition, because they own the equipment used to create the e-mail messages and the network used to send them, courts feel employers have the right to monitor employee communications.

"They really can't search your locker, but they can search your PC," says Rich Stim, an attorney and editor with the Nolo.com Web site. "The employer is considered to own the hardware and the bits (of data) . . . Just accept that it's a grim world for employees."

The only respite. About the only area where employees have gained a small measure of freedom of speech is through anonymous postings from home-to-newsgroups that could be inflammatory about an employer. In the past, the employer could make a request to the ISP (Internet service provider) about the identification of the person making the post. ISPs typically provided this information to avoid potential lawsuits, leaving the employee at the mercy of the employer.

However, some ISPs now first notify the person making the post that an employer has requested their identification. If the person making the post hires an attorney, he sometimes can have his identity protected through a court order. This type of protection for an employee still must undergo testing through several trials to establish a precedent, experts say.

■ **Loss Of Inhibition.** Because e-mail typically is a communications medium where users feel more emboldened to make disparaging statements, employees must be especially careful about what they type, experts say. For example, an employee might type a threatening or obscene statement in an e-mail message that he'd never consider saying to a co-worker's face. To compound the problem for the employee, he's now created a permanent record of his statement.

This problem is especially prevalent in sexual harassment cases, where two employees might exchange messages about a third employee or about offensive material; messages that contain typewritten words that neither employee would say aloud in the workplace. "E-mail is a funny medium," says Howard Meyer, a retired professor at the University of Buffalo School of Law. "There's an intimacy there . . . It's an entirely different medium."

Even though each employer has different standards for determining which types of statements could lead to termination, experts say employees should always err on the safe side. If an employee has any doubt about whether an e-mail message could be misinterpreted or inflammatory, it's best not to send the message.

■ **Employer's Bill Of Rights.** Most employers, especially those with thousands of employees, have developed guidelines for employees in regard to e-mail and computer usage, usually called AUPs (acceptable use policies). The American Management Association estimates 90% of companies that

monitor employee communications notify their employees about the possibility of monitoring.

Despite this concession by employers, you shouldn't expect to find employees who are willing to give employees full free speech rights concerning e-mail usage in AUPs. Employers aren't going to make the AUPs so restrictive that they'll drive away current and future employees, but they are going to make them restrictive enough to make them effective. "You might have a set of policies that might make it difficult to obtain and retain employees," says Jonathan Rosenoer, author of "Cyberlaw: The Law of the Internet." "(Employers) have to draw the balance between the risks."

Even if your company doesn't have an AUP, the employee still must be aware enough to know the employer might be monitoring her e-mail. "There have been cases where employees were surprised to find out their e-mail was being logged," says Rosenoer, who also is a senior vice president of strategy and planning for InterTrust Technologies.

While most companies have established AUPs specifically in regard to e-mail usage, some companies may not have them. Most experts say employees at such companies shouldn't ask for guidelines in writing, because they're better off not having specific rights spelled out if a case ends up in court. "I'd be hard-pressed to think of an example where creation of (an AUP) would help the employee," Walton says.

Most AUPs are similar from company to company, but it's up to each employee to make sure he can live within the limitations

## Why Do Employees Read E-mail?

If you think your employer is just being cruel (or nosy) by reserving the right to read the e-mail you send at work, think again. Employers have some good reasons for tracking e-mail usage among employees.

**In-house protection.** Employers need to protect themselves from potential lawsuits, concerning everything from sexual harassment to age discrimination. By monitoring e-mail messages, employers can sometimes head off a potentially serious problem before it starts.

In addition, if a case goes to court, employers can't claim ignorance about what an employee was doing with the employer's equipment, especially when monitoring tools are available. "If the

employee would defame someone using an employer's PC, the [person who was defamed] would be able to argue against the employer as an agent and put the employer in the lawsuit," Walton says.

**External protection.** If an employer can catch an employee sharing company secrets with competitors, the employer will benefit greatly from monitoring e-mail messages.

**Heading off danger.** As we've all seen in the news far too often recently, disgruntled employees can become violent. By monitoring e-mail messages, employers might be able to defuse a potentially violent situation. □

of the AUP for his particular employer. "The best advice for employees is, when they're going into a job, to carefully review the employee manual... and make sure they feel comfortable before they [accept the job]," Rosenoer says. "It's very hard for me to imagine a policy that's so oppressive that you wouldn't want to stay."

If you have a specific need in regard to e-mail use that the AUP prohibits or doesn't address, you might want to bring it up with your employer when you're hired. "It's worth it to fight (the AUP) if enough people agree," Walton says. "Sometimes it's in the employer's best interest to change it. These things get altered all the time."

■ **The Future.** At some point, Meyer says he would expect unions to begin using e-mail monitoring as a bargaining tool. Because white-collar workers don't tend to belong to unions but are heavier users of e-mail at work than blue-collar workers, Meyer says it could be a slow process, though.

Even though employers have established a precedent giving them control over e-mail messages generated by employees at work, Meyer says the employers need to make sure they don't abuse their power. He says the judicial system typically has taken the side of the employee whenever signs of abuse of power are evident, such as when formulating worker's compensation laws.

Rosenoer says that new technology in the future could alleviate some of the e-mail privacy concerns for employees by allowing them to block the employers' access to messages. For now, though, he says employees should always be extra careful when it comes to using company e-mail. "When they write something down, it can be used against them," Rosenoer says. "The record is permanent. Comments can come back to haunt people, and they need to understand that." □

by Kyle Schurman

## Employee Monitoring Statistics

The American Management Association (<http://www.amanet.org/research>) surveyed 1,627 large and mid-sized companies to learn about the monitoring habits of their employees. Here are the results of the survey.

- In 1997, about 35% of the companies surveyed monitored employee communications at least periodically; in 2001, about 80% monitored communications.
- About 47% of the companies currently monitor e-mail usage; about 63% monitor Internet usage. In the 2000 survey, about 38% monitored e-mail, and 54% monitored Internet usage.
- About 65% of the companies say they've disciplined a worker over e-mail or Internet usage transgressions; about 27% say they've fired an employee over such transgressions.

Source: American Management Association

# Glossary Of Terms

**AGP (Accelerated Graphics Port)**—A high-speed graphics port that allows fast communication between the graphics controller and computer. This port runs at least twice as fast as older PCI (Peripheral Component Interconnect) video cards and allows the graphics card to directly access the computer's main memory.

**decryption**—The process of translating encrypted data back into their original language.

**DHCP (Dynamic Host Configuration Protocol)**—A method of automatically assigning IP (Internet Protocol) addresses to all the Internet-connected nodes in a given network. The Internet's TCP/IP standards require that every computer and server connected to the Internet is assigned its own unique IP address. Instead of having a company's network administrators manually assign each machine a different IP address, DHCP lets administrators control and manage the distribution of IP addresses from a central point within the network.

**Dolby Digital**—An advanced audio technology with six channels—two front satellites, two rear satellites, a front center channel, and a sub-woofer. Currently, Dolby Digital is the leading surround sound technology for PCs.

**DSL (Digital Subscriber Line)**—Technology used to transmit digital data on regular copper phone lines. The technology differs from ISDN (Integrated Services Digital Network) lines in that it can send analog and digital signals over the phone line. ISDN is digital only and has to convert analog voice phone calls to digital signals. With DSL, the analog voice phone calls and digital signals can coexist on the same wires. This works because analog signals require only a fraction of the capacity of the copper wires that make up a phone line. The limitation of the analog signal carried on those wires, not the wires, has kept phone lines from delivering greater data transfer speeds. Sending digital signals over copper wires breaks that barrier.

**encryption**—Encoding a file to prevent others from accessing its contents. An encrypted file appears as a string of gibberish. Users must decrypt the file to read or use it. Files are usually encrypted using encryption programs.

**heat sink**—Some computer components generate heat as they operate because they run so quickly. To prevent components from overheating and breaking down, heat sinks may be installed to absorb and eliminate the heat. Often, computer manufacturers install these small metal devices on powerful processors to keep them from overheating.

**IDE (Integrated Drive Electronics)**—This is the general name used for the type of hard drives that dominate the consumer market. In reality, through, IDE refers to the process of building the drive controller into the drive itself rather than on a separate card.

**L1 cache (level 1 cache)**—In advanced microprocessors, frequently accessed data and machine instructions that can be held internally in cache memory until they are no longer needed. L1 caching makes microprocessor operation much more efficient.

**L2 cache (level 2 cache)**—Additional cache memory that can be accessed more quickly than the primary cache. Typically external, the L2 cache is generally located on a separate chip or an expansion card. This additional memory is used to supplement the small L1 memory available to the CPU.

**macro**—A series of keyboard and mouse actions recorded to a single key, symbol, or name. Macros are helpful when you perform a task often.

**MIME (Multipurpose Internet Mail Extensions)**—(Pronounced mime.) The standard format for attaching non-text files, such as graphics and spreadsheets, to text-based e-mail messages.

**motherboard**—The main controller board in a PC. The motherboard is a PC's central nervous system, the device into which all peripherals eventually connect and the central exchange over which all system data communications move.

**NTFS (NT file system)**—A file organizational system by which data is stored and accessed in a Windows NT operating system. NTFS offers better methods of data protection

and file recovery than a FAT (file-allocation table), the file system of DOS and Windows 3.x. It also supports long file names.

**PCI (Peripheral Component Interconnect)**—The Intel local bus standard that allows for faster communication between a computer's CPU and peripheral components, thus speeding up operating time. Most PCI buses coexist on a motherboard with an ISA (Industry Standard Architecture) or EISA (Extended Industry Standard Architecture) bus, so the user can plug in expansion cards compatible with either standard.

**PGP (Pretty Good Privacy)**—PGP is a public-key, or asymmetric encryption application. The software creates two keys: a public key and a private key. You can freely send the public key to anyone you want to receive encrypted e-mail from. The private key decrypts any message encrypted by the corresponding public key.

**processor**—The integrated circuit, known as the CPU, that controls the computer. Today's microprocessors, such as the Pentium 4, cram more than 42 million transistors into 1 square inch of space. Microprocessors are responsible for interpreting instructions gathered from input devices and transmitting the results to output devices.

**SCSI (Small Computer System Interface)**—(Pronounced scuz-zee.) A standard for parallel interfaces that transfers information at a rate of up to 80MBps (megabytes per second). Up to seven peripheral devices, such as a hard drive and CD-ROM drive, can attach to a single SCSI port on the system's bus.

**Trojan horse**—A program that falsely appears to be a useful application, such as a game or a utility, that slips into a system unnoticed.

**worm**—A destructive program containing code that replicates itself until it fills the target drive or network, thereby causing it to malfunction.

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